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ELECTRICAL WORLD

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1935

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FEDERAL AID USED AS A LEVER

•

DISTRIBUTION SERVICE AND COSTS

•

MACHINES DON'T LAST FOREVER

•

DAVIDSON ON FAMILY RELATIONS

•

USE OF HIGH-VOLTAGE MOTORS

•

REPAIRS 38-KV. LIVE LINE

•

VENTING RAISES HYDRO OUTPUT

•

BEAUTY AND UTILITY IN LIGHTING

•

COMING—
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Reader's Guide to This Issue

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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Trends

As Gleaned from This Issue of "Electrical World"

▸▸High-Voltage Motors

High voltage is the latest fad. The research people hope to break down atoms with it; Boulder power will go merrily along somewhere to set a new record in power transmission; they are talking of 200,000-volt underground cables and 60,000-volt generators. But what about motors? That is another story. There is a rate inducement for primary service. There are some economies in high-voltage motor design. These are advantages. But when it comes to safety, to control devices, to space factors and to ratings there is another side to the story. George H. Hall tells this story in this issue. He says do not use them below 100-hp. ratings. But special designs and larger motors may save money at upward of 13,500 volts. Engineer buyers as well as motor and control manufacturers will do well to read this article.

▸▸Hydro Efficiency

The end would seem to be attained in hydro plants that are about 98 per cent efficient. But that is at ideal conditions under rated loads. The Kaplan turbine with adjustable blades came along to help operation under variable load and flow conditions. Now C. J. McLean tells us in this issue that machine efficiency can be increased at partial gate openings by admitting air into the turbine casing. The effect of breaking vacuum on low-head units is to increase efficiency. This opens a new field of exploration in hydro unit design, control and operation. Air and water can mix, even though oil and water won't. Why not explore this subject a litle further?

▸▸Cost of Distribution

About 25,000,000 customers tie on to utility lines. They expect service at all times in unlimited quantity. This is expensive and brings up the cost of distribution. Below the academic debate that occurs on cost allocation and rate making lies a realm of reality. M. M. Koch talks about it in this issue. Can the number of poles per customer be reduced? What about fewer transformers per customer? Bare wire and aerial cable fit in. Staving off underground construction. Housekeeping on distribution systems. These are the topics that engineers and manufacturers of distribution equipment are interested in. Distribution and distribution equipment are in a state of flux. It is a big business. Mr. Koch knows what he is talking about. He makes good suggestions.

▸▸Lighting for Beauty

Leading architects use light as their motif in design for large buildings and auditoriums. A. L. Powell tells about a fine installation in this issue used for demonstration purposes. We wish home architects would take up the subject in the same way. Most of us can't see in comfort in our own homes and our wives make mean remarks about the fixture monstrosities encountered in most homes. Conditions are improving but progress is slow. We now have available glass and synthetic products to use in architectural lighting. We have fixtures and fittings that look well and serve well. What we need is a recognition of these things by home owners and home builders. We need to sell Better Light-Better Sight in a literal sense and an architectural sense. Demonstration affords one of the best tools.

Our Recovery Number

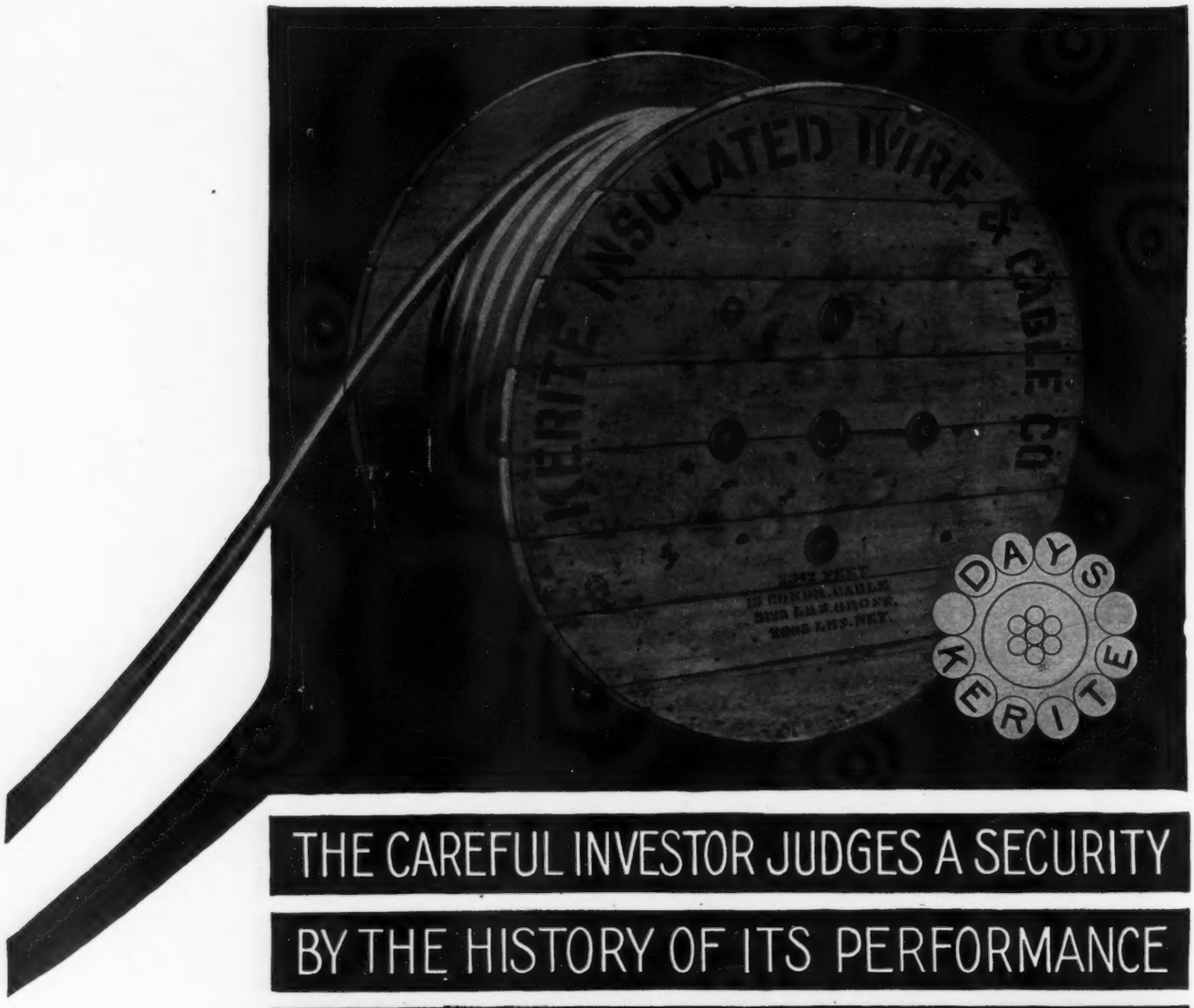
Do not miss the March 30 issue of "Electrical World." It is a special service for the electrical industry. It goes to a non-electrical audience. It shows the facts about the industry and suggests a program for recovery through action by the industry.

▸▸Live-Line Working

An interesting story of live-line working down in Bolivia is told by Mr. Talbot in this issue. This practice has proved safe in many sections of this country and very ingenious tools have been developed for live-line workers. In many other sections utilities still hesitate to go to live-line maintenance. Where service continuity is essential very often live-line work is of great assistance, as was the case in Bolivia. At least one skilled live-line crew should be available on large transmission properties to handle these cases. Incidentally, the Bolivia story gives some good experience on conductor vibration, line design and other features of transmission construction and maintenance that should give good tips to American engineers and manufacturers. We believe in using the correct design and construction available for every transmission line. This saves a lot of grief after the line goes into operation.

▸▸Those Obsolete Machines

Old Father Time can be counted upon to create business despite the depression. Our statistical editor has done a bit of digging into census statistics on machinery. He finds that about 1,000,000 kw. of generating machinery comes to a twenty-year age each year between 1934 and 1939. But why stop with generators? Motors, transformers, control equipment and what not were not manufactured during the past year or two in a volume to care for replacement alone of old, decrepit apparatus that limps along because loads have been down. Deferred replacements running into hundreds of millions of dollars of electrical equipment are uniting with a demand for new equipment. All one needs to do is to read the article in this issue and glance at the power output of the utilities to realize that this industry may expect a business by fall that will cause it to stagger under the load. This is our prediction—and it is based upon facts.



THE CAREFUL INVESTOR JUDGES A SECURITY

BY THE HISTORY OF ITS PERFORMANCE

KERITE

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CONTINUOUS PRODUCTION HAS ESTABLISHED

A RECORD OF PERFORMANCE

THAT IS UNEQUALLED IN THE HISTORY OF

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ELECTRICAL WORLD

MANAGEMENT • ENGINEERING • OPERATION • UTILIZATION

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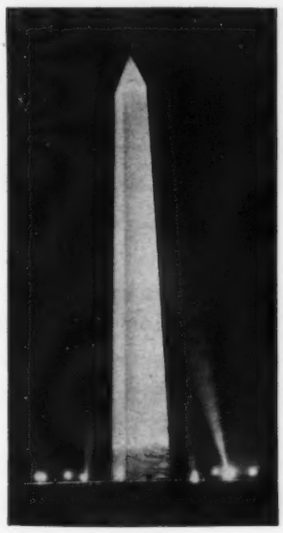
MARCH 16, 1935

Harmony Will Bring Recovery

THE Administration appears to be out on a limb of its reform-recovery program. Business, agriculture, labor, the Huey Long-Father Coughlin public and even Congress are turning against it and growling ominously. Such is practical politics in a world of self-interest. However, the opposition has no unity, and this is not unlike the conditions that also prevail in the Administration.

Harmony is essential to progress in a democracy. The government, industry and the people must be in agreement and act toward each other as friends, not enemies. The thinking men in the Administration and in the nation should take this lesson to heart. More than this, they should attack the political and economic insanities of the day with a Johnsonian vocabulary that will be understood by the people.

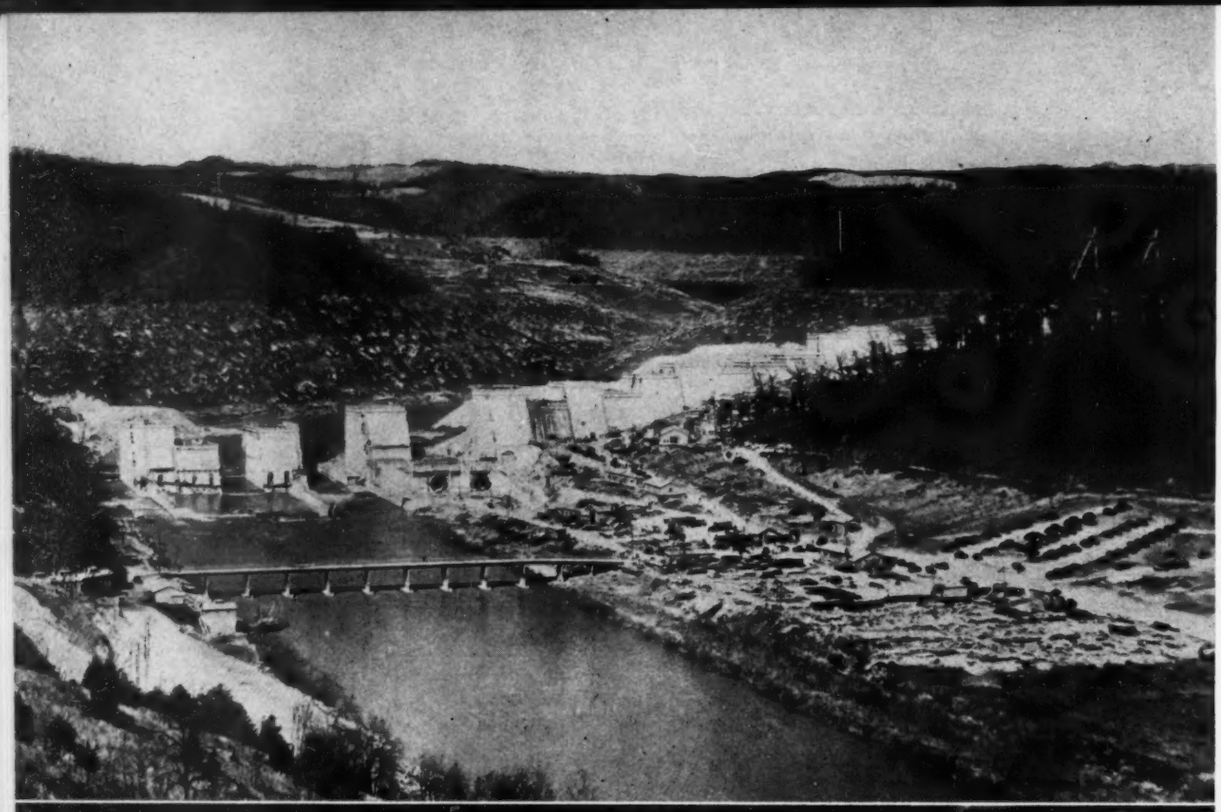
These conditions are quite specific as applied to the utilities. The view toward Washington is cloudy, with many thunderstorms. The opposite view toward customers is bright and sunny. We see Washington trying to abolish the holding company; sending utility bills to all the state legislatures which, if passed, would strike at the heart of private ownership; developing more plans for yardsticks and subsidized competition and using the full power of the federal aid lever to force socialization of the utility industry. All this is punitive. Also, it is but a Don Quixote. For the people of this country do not wish to have government ownership of utilities, and no sane taxpayer or statesman would even contemplate a huge $13,000,000,000 government bond issue to make this possible. Government credit is already strained, budgets are already unbalanced to the danger point.



So much for Washington. Let us look at conditions on the utility properties. Loads are up to all-time-high values and promise to increase. Sales of products and appliances are being made in almost unprecedented volume. Local public relations have improved greatly. Operating forces are stressed to supply the service demands. Executives are under pressure to build new plants or to expand existing facilities, and wonder where they can get the necessary capital. Out where people live conditions are favorable for a large expansion in the utility business. This would aid recovery.

Thus utility executives, like Janus, face two ways. In Washington they give time and attention to destructive legislative proposals and at the same time try to operate their properties and meet the increasing demands of their customers for service. The Administration likewise, in some departments, is obnoxiously busy with plans for so-called reform or punitive legislation for utilities and in others is equally busy trying to stimulate electrical use and electrical products sales through action by private industry. This is a ridiculous situation.

Leadership and action by the Administration should be directed toward recovery and not to reform in the utility business. Reform is here already and should no longer serve as an excuse for attacks by public ownership advocates or the aggrandizement of selfish bureaucrats in Washington. The electrical industry can put a million men to work and stimulate a business volume of billions of dollars if given fair treatment and a chance to attend to its present business and stir the latent demands. This is a recovery program that is sound and stable and available to the Administration.



Acme

FLOODLIGHTING EXPEDITES DAM BUILDING

Despite the Grubb decision which acts to stop the T.V.A. contractual acquisition of properties and distribution systems, the construction work on Norris Dam continues night and day. The government is using floodlighting in grand proportions to expedite the task. Fifty miles of back-up will impound 3,600,000 acre-feet. Some idea of the lake can be obtained from the cleared area above the dam.

Federal Aid Used as Lever

Sample Bills Sent to States Dealing With Utilities—Would Give Federal Control in Return for P.W.A. Money—Another Step Toward Government Ownership

UNDER COVER of the Wheeler-Rayburn barrage on the Washington front, Secretary Harold L. Ickes is executing a major flank movement in the war to socialize the electric light and power industry. Included in a series of eleven bills recently sent to the governor of nearly every state, with the tacit approval of President Roosevelt, are three drafts from the P.W.A. of recommended legislation dealing with public utilities.

The most important of these, P.W. 28658, the "Electric Membership Corporation Act," lays the base for a mopping-up campaign on the operating companies after the centralized defense of the holding companies is destroyed by pending congressional action. While on the surface this is a harmless bill, providing for the extension of electric service into areas now unserved, careful reading indicates that several jokers broaden its effect to permit the complete socialization of the light and power industry. Under this act any three local public ownership advocates could organize a nonprofit mutual corporation "for the purpose of promoting and encouraging the fullest possible use of electric energy by making electric energy available at the lowest cost consistent with sound economy and prudent management." This would be a private corporation composed of consumers paying a membership fee of one cent to $10. The directors of this corporation would have complete power to regulate the "admission, withdrawal, suspension or expulsion of members."

Among these powers, Article XII, Section L provides the right "To condemn either the fee or such right, title, interest or easement in property as the board may deem necessary for any of the purposes mentioned in this act, and such property or interest in such property may be so acquired whether or not the same is owned or held for public use by corporations, associations or persons having the power of eminent domain or otherwise held or used for public purposes." And the act also provides that "the court in which such proceedings are filed shall, upon application by the corporation and upon the posting of a bond with the clerk of the court in such amount as the court may deem commensurate with the value of the property, order that the right of possession shall issue immediately or as soon and upon such terms as the court, in its discretion, may deem proper and just."

Federal Suggestions to States

Drafts of bills affecting utilities have been made and sent to state legislatures for action under the auspices of the Public Works Administration. The three bills affecting utilities are:

P.W. 29014—An act creating a rural electrification authority.

P.W. 29015—An act creating power districts.

P.W. 28658—An act creating nonprofit membership corporation.

An analysis of these proposed bills is made in the accompanying article. They strike at the foundations of the private utility business. They destroy state regulation. They place control of the utility business in the hands of the federal government. By inference, at least, P.W.A. money will be granted only if the provisions of these bills are accepted. Legislatures are now discussing them. They should be studied by the industry.

Section G provides the power to accept gifts or grants of money from federal agencies.

Section 18 contains one of the jokers. It provides that any of these mutual corporations may extend its territory by filing in the office of the officer charged with the duty of recording deeds of the county in which such new territory is located a certificate containing a reasonable description of the new territory, and then goes on to state that in the event such new territory includes part of the territory of another corporation, a certificate must be filed to the effect that such other corporation is not ready and able to extend this service. This would apparently indicate that private corporations would be free from molestation unless they refused to extend service. The joker lies in the definitions in Section 3, whereby the word "corporation" is specifically limited to mean "corporation formed under this act."

The act as a whole would sweep aside all existing state acts in conflict, including commission regulation of rates, the negotiable instrument acts and banking acts forbidding preference to individual depositors.

It is carefully drawn to prevent electric membership corporations returning to private ownership, even though the members were anxious to do so. A federal government holding of 26 per cent of the outstanding bonds could veto the sale of any property.

If after a period of mutual operation, the membership should become fed up with political management or should find that extensive improvements were necessary that they were unable to finance, due to the gradual deterioration of the property, they could, by majority vote of the membership, dissolve the corporation and leave the bondholders or the federal government holding the bag, but they could not sell the property.

The act is very carefully drawn to avoid constitutional limitations and

the entire program contemplates procedure in the state courts. It would be possible by a simple act of Congress, similar to the Johnson bill, to deny to investors the protection of the federal courts.

Large industrial and commercial consumers would be at the mercy of the leaders of the residential consumers, who of course would hold the majority control of the membership corporation. There would be no state public utility commission protection against discrimination. Undoubtedly the substitution of 4 per cent federal funds for the 4½, 5 and 6 per cent investment of stockholders and insurance companies would permit the reduction of rates and the complete control exercised by the directors of the corporation would permit them to forego any provision for the replacement of worn-out property. Thus for a time corporations of this sort could make an excellent showing in the reduction of residential rates and make an apparently convincing argument for socialization. The dilapidated state of the railroads after a short period of government management during the war, which led to their complete breakdown in 1920, would be as nothing to the headache that would come to the consumers of electricity when the rosy promises of the promoters of electric membership corporations ran up against the hard facts of economic life.

Rural electrification authority

At the top of the all-embracing Rural Electrification Authority outlined in P.W. 29014 are three members appointed by the governor and serving without pay. The announced corporate purpose is

> to encourage and promote the fullest possible use of energy by all of the inhabitants, by rendering service to said inhabitants, to whom energy is not available, or, in the opinion of the board, is not available at reasonable rates.

This at once ignores the factual determination of reasonable rates by the established regulatory commission and leaves reasonableness to the opinionated determination of an administrative board placed as it is in a competitive position.

The authority can acquire electric properties and systems, fix the rates, use public streets and rights-of-way held by any political subdivision of the state and exercise the right of eminent domain, even in precedence of corporations already in exercise of the right of eminent domain. In connection with its contractual powers the authority is empowered to stipulate

> covenants, terms and conditions with respect to resale rates, financial and accounting methods, services, operation and maintenance practices, and the manner of disposing of the revenues . . .

Funds can be derived by issuance of bonds authorized by resolution of the board, with the interest cost to maturity not to exceed 6 per cent, payable semi-annually. It is stipulated that the bonds shall be valid independently of any irregularity in acquiring or improving the physical system against which they are issued. The mere fact that they are issued pursuant to the act is to be conclusive evidence that the bonds are valid and regular. No holder is ever to have the right to compel any exercise of the taxing power to raise funds for the payment of interest or principal. The bonds do not become a debt of the state; they are a lien only against the revenues pledged to their payment.

Just to make sure that some subsequent legislature, possibly too eager to give away electricity, does not reduce the rates to the point where the venture could cease to be self-sustaining, there is a pledge given by the state that it will not alter the authority so that the latter cannot charge rates high enough to keep the enterprise solvent. Conversely, the bondholder is granted the right to sue to force the authority to keep the venture self-sustaining. Rates are to be fixed and adjusted to this end. Any surplus is to be devoted to rate reduction.

Power districts created

Power districts may be initiated by municipalities by resolution declaring the public necessity in the third bill. The state authority shall then investigate and, if satisfied, shall set up a district corporation with its governing board of directors. The authority may also initiate such districts or the move may be started through a petition of 10 per cent of the electors of the central municipality. The announced broad purpose of these districts is to conduct and operate

> a utility, and to carry out such purpose [they] shall have power and authority to acquire, construct, reconstruct, operate, maintain, extend or improve any utility within or without the district, and to furnish, deliver and sell to the public and to any municipality and to the state and any public institution heat, light and power service and any other service, commodity or facility which may be produced or furnished in connection therewith.

The directors are to be paid at the rate of $10 per day when engaged on board work.

Bonds issued by these power district boards have practically the same inviolate validation as those of the state authority. Preliminary organization and administration expenses may be met by municipal appropriations, with some arrangement for reimbursement out of subsequent revenues of the power district. The municipality is empowered to borrow money for one year in order to make this advance and can do so regardless of its status relative to the statutory debt limitation.

The eminent domain clause also appears in this bill:

> Any district shall have power to condemn either the fee or such right, title, interest, or easement in property as the board thereof may deem necessary for any of the purposes mentioned in this act, and such property or interest in such property may be so acquired whether or not the same is owned or held for public use by corporations, associations or persons having the power of eminent domain, or otherwise held or used for public purposes, including lands held and used for cemetery purposes; and such power of condemnation may be exercised in the mode or method of procedure prescribed by . . . or in the mode or method of procedure prescribed by any other applicable statutory provisions now in force or hereafter enacted for the exercise of the power of eminent domain.

If these bills were to pass the legislature of any state the Public Works Administrator, by virtue of the funds at his command, could within a short time take over the entire light and power industry of that state without the approval of the people of the state and the private investors would have no recourse except to argue in the courts over the price they would some day receive.

All that is needed to complete the organic structure from the hierarchy at the top to the hamlet at the bottom is a Federal Power Authority to integrate these detached units into a group of national networks. Presumably the Federal Power Commission will, on the strength of its power survey, propose the establishment of just such a Federal Power Authority. But for the present the legislative set-up is directed ostensibly at making uniform the relation of each state with the P.W.A. so that it may qualify for its share of the P.W. A. allotment out of the billions in the $4,800,000,000 relief bill. Recent action on these proposals in North Carolina and Connecticut indicate that states will be slow to sign away their rights to the federal government.

Distribution Service and Costs

Where Opportunities Lie for Improving First and Cutting Last — Transformer Ratings and Loading — New Developments — Bare Wire and Aerial Cable — Compromises With Underground

By M. M. KOCH
Superintendent of Electric Distribution
Public Service Company of Colorado

Practices followed to provide high-grade service at the lowest unit cost vary greatly, as indicated by the survey presented in the November 10 issue. How much the practices are influenced by individual opinion, economic studies or existing system conditions could not be shown in that summary. Only when the practices are studied by system do the widely divergent practices assume any semblance of logic. One such discussion is presented.

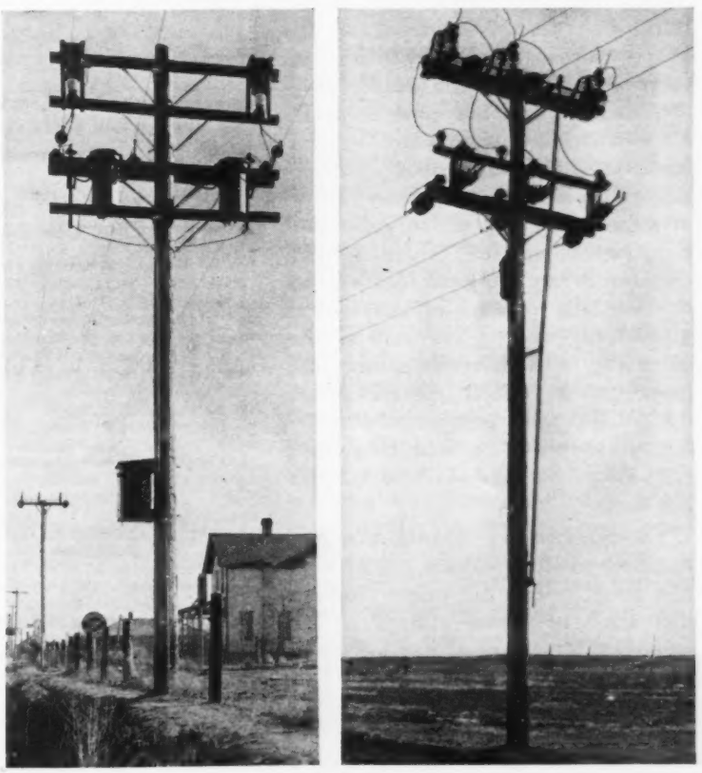
SERVICE improvement is largely dependent on local conditions and the type of service now being rendered, so that it is difficult to make any statements that would be generally applicable. However, it does seem reasonable to assume that service improvement in most any system would mean fewer interruptions and better voltage regulation.

Reduction in service interruptions might be attained by any one of a number of improvements in operating practice. Depending on local conditions, they might include tree trimming, slack pulling and a host of other practices. But any system undoubtedly could improve its service record by the use of branch-circuit fuses on the primary lines and the greater use of live-line tools for repair work on such circuits that normally cannot be worked energized. Use of automatic circuit breakers, instead of fuses, in the customer's installation would be a big factor in service improvement, since so many interruptions are due to trouble in the customer's appliances or wiring, and the cost of fuse replacements is quite an item to the power company. I believe it would be sensible for power companies to push this type of equipment in all new installations by proper contact with wiring contractors and city electrical inspection departments.

Improved regulation and the reduction of flicker is probably desirable in nearly all companies, but the answer to the problem is largely one of economics. Each company must find the best solution for its own problem.

Reduction of Costs—Probably the best way to reduce construction costs is to obtain a higher degree of standardization in all materials and equipment used on the distribution system. This is, of course, a very difficult task, since there are so many different opinions as to the type of assembly that should be used and the type of equipment that is required for a particular job. For example, numerous types of watt-hour meters are now on the market for installation in the new sequence. Obviously, meter costs cannot be brought down to a reasonable figure until a better degree of standardization is attained. Many other pieces of equipment used in the distribution system are in the same category.

Operating costs are so closely related to the type of service that is being rendered or demanded that it is very difficult to offer any general suggestions as to ways and means of reducing them. A lot depends on the requirements of other departments of the company; for example, rates. Considerable expense is incurred annually in checking and rechecking customers' installations where the rate is based on connected load. If actual demands are measured, considerable expense is incurred in providing and servicing



13-kv. metering installation and repeating fuses for rural wholesale customer

demand meters. Primary metering costs are excessive in some instances, and the need for this type of rate should be given careful study before it is applied. Another item of expense that might easily get out of control involves keeping records of various items in the distribution system. The types of records that are demanded by utility commissions or company departments other than distribution may greatly influence such costs. For instance, a detailed pole record is not warranted, in my opinion, though many companies keep such a record.

Loading Transformers—In loading transformers our practice has been to make a load check on all units in service in the urban areas between November 15 and January 15. This survey is made by means of a split-core current transformer and ammeter. From these data we determine which transformers should be changed because of overloads or underloads. An effort is made to secure 150 per cent of rating on single-phase commercial and industrial installations and 125 per cent on three-phase industrial installations.

Installation of devices which indicate the load on the transformer as a function of internal temperatures is hardly justified for the ordinary distribution transformer, since such devices do not tell with sufficient accuracy what the total load on the transformer is. To arrive at the proper capacity to install, when transformers are found overloaded, some sort of a demand test must be made. Furthermore, individual transformer loads are of decided value in determining block loads preparatory to rearrangements of the primary distribution system, or for providing data required in analyzing the load and determining the pattern for new feeders or rearrangement of old feeders. Incidentally, current readings are also made on the various feeder branches during the time of the transformer tests, thus providing additional data for the solution of feeder-design problems.

Standardization of Transformer Ratings—Generally speaking, our practice has been to use the present ratings that have been standardized by all manufacturers, except that we try to avoid the smaller sizes (under 5 kva. for voltages in excess of 2,300/4,000. We believe in uniform secondary wire size—two No. 4 and one No. 6—for normal residence and small commercial business districts. With a fixed wire size and transformers spaced at first every other block, and eventually in every block, the standard ratings provide satisfactory flexibility without tending to create too great a ratio of transformer capacity to feeder demand. This policy, according to our calculations, appears to be an economical one.

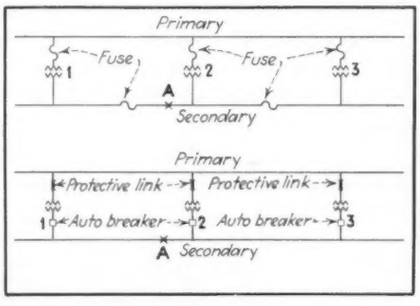
A gang of outdoor meters

Specifications call for a mounting height of 6 to 7 ft. above ground to avoid damage and still have meters close enough for reading and servicing.

Attitude on Some New Developments—Not having experimented with transformers having automatic reclosing devices on secondaries we have no experience to indicate their value. For years we have tied together secondaries of all transformers on the same feeder in the same alley through secondary sectionalizing fuses located about midway between the transformers. If automatic devices incorporated in the secondary side of the transformer can be obtained with very little increase in cost over separate units it would doubtless prove a very desirable adjunct to our present arrangement. Various types of devices and their application have been given considerable study, but we are not yet convinced that their increased cost is warranted at the present time. Continued use of a primary cutout on each transformer seems still necessary, unless the long service interruptions that are possible without such cutouts are no objection. The idea of completely self-protected units seems to be good in theory.

Pole-mounted voltage regulators and reclosing circuit breakers apparently do not take the place of similar substation equipment and should be used in conjunction therewith to minimize the extent of service interruptions and to improve voltage regulation on feeders of certain types. Both pole-mounted regulators and reclosing breakers have a very definite application, but their use and installation will be largely governed by economic and service considerations.

Bare-Wire Primaries and Aerial Cables—Bare-wire primaries have been used to a large extent in rural areas and in the larger sizes for subtransmission voltages. Generally, for urban



Present method of isolating disturbance and one method of using self-protecting transformers

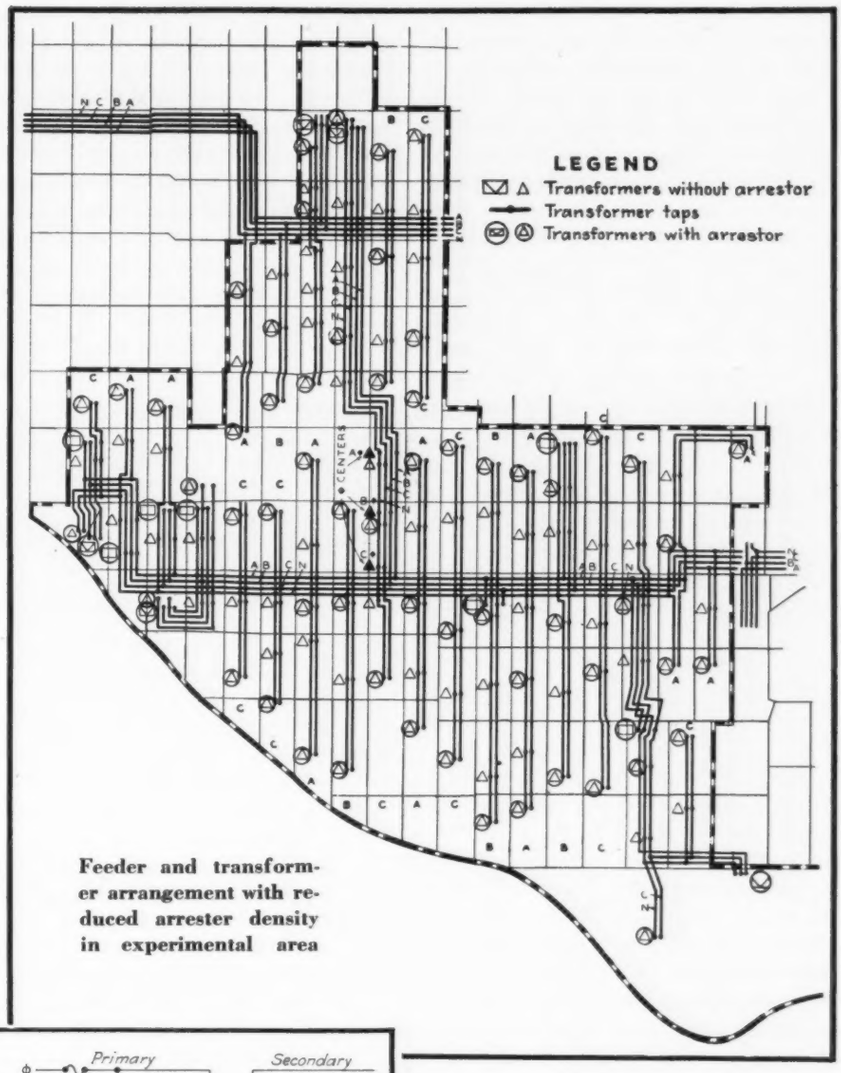
If a short circuit occurs at "A" with the present system, the secondary fuses between transformers Nos. 1 and 2 and between Nos. 2 and 3 will blow, as well as the primary fuses on transformer No. 2, thus clearing the trouble and indicating by location of customers' calls where the transformer is out of service. However, if the automatic breaker scheme is employed, a secondary short at the same point would first trip the breaker on transformer No. 2, and eventually on transformers Nos. 1 and 3, and so on down the line, thus interrupting service to a much larger area. The continued use of a primary cutout on each transformer still appears to be necessary. Should transformer coils fail, or should a flashover occur due to dirty primary bushings or lightning, the primary cutout is necessary to clear the trouble. If the scheme shown in the second sketch is employed, and bushing trouble occurs, the feeder will trip. If the transformer coil fails, in all probability the feeder would trip, because of the high current rating of the protective link. If the protective link does not blow, or causes fire in the transformer, reclosure of the feeder breaker at the station may give rise to more serious trouble. Transformer troubles would, therefore, cause an interruption to the entire feeder area, whereas when fuses are employed the trouble is localized to an area consisting of one or two city blocks.

work, we feel that weatherproof wire is usually required because of the hazards involved in erection in congested areas. In purchasing such wire we have adopted the Utilities Research Committee's specifications.

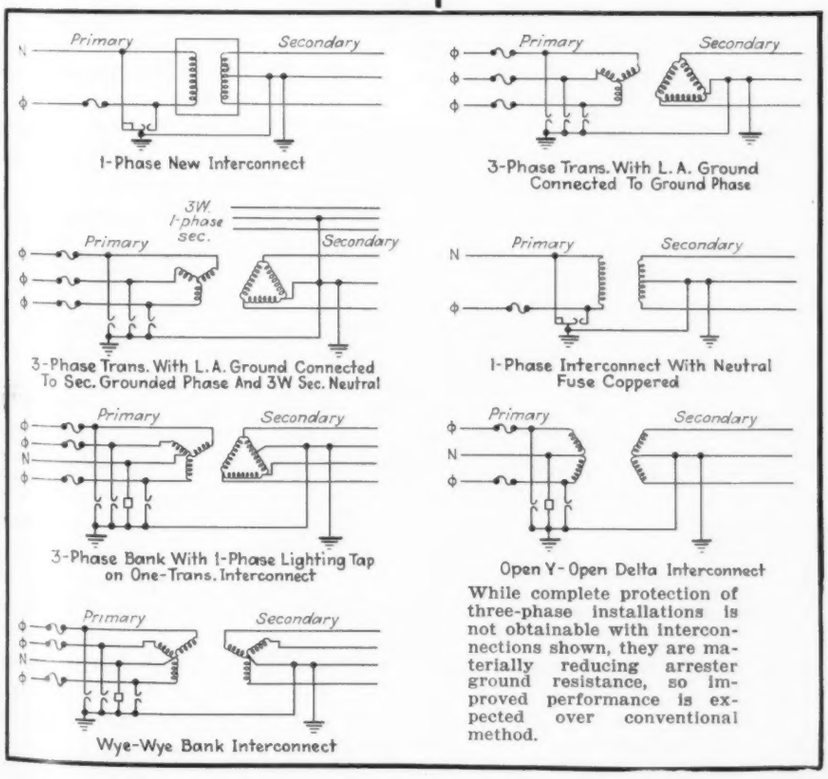
So far we have not had occasion to use aerial cables for primaries. Some tree-wire installations have been made, but of the single-conductor variety.

Compromises With Underground—Cable connections from underground primaries to pole transformers have been used in one case. This installation was required because we were forced to approach the customer underground and did not feel warranted in spending additional money for a transformer-vault installation. Generally speaking, there may be occasions when this type of installation would be somewhat less costly than an underground transformer vault, but it would not seem possible to make such installations where an underground system has been established because of public opinion or city law.

Cables have not been used for secondary or primary transformer risers because the extra expense did not appear to be warranted. However, we have tried some duplex and triplex service drops of various types. Thus far, our experience indicates that the duplex or triplex service is too heavy,



Feeder and transformer arrangement with reduced arrester density in experimental area


Primary
Secondary
1-Phase New Interconnect
3-Phase Trans. With L. A. Ground Connected To Ground Phase
3W. 1-phase sec.
3-Phase Trans. With L. A. Ground Connected To Sec. Grounded Phase And 3W Sec. Neutral
1-Phase Interconnect With Neutral Fuse Coppered
3-Phase Bank With 1-Phase Lighting Tap on One-Trans. Interconnect
Open Y-Open Delta Interconnect
Wye-Wye Bank Interconnect

While complete protection of three-phase installations is not obtainable with interconnections shown, they are materially reducing arrester ground resistance, so improved performance is expected over conventional method.

Various methods of interconnecting lightning arresters and secondary grounds

causing undue strains on the buildings and tending to pull the distribution poles badly out of line. None of these have been in service long enough to ascertain whether replacements will be more or less frequent over a long period of time than is the case with open-wire service drops.

Arresters on Distribution—Lightning arresters are used at each transformer installation, except in densely built-up business districts, where one set of arresters per block is usually considered adequate. In two experimental areas the arrester density has been materially decreased. In one, arresters have been installed on every other transformer or about every other block. In the other area arresters have been installed only on the last transformer at the end of the primary laterals, or one set of arresters for about every four transformers.

In about half of the Denver distribution system we have interconnected the primary, secondary and arrester

grounds. Thus far this type of connection appears to be an improvement over the the non-interconnected type.

Arresters are also installed on underground terminal poles supporting 2,300/13,000-volt circuits and on metering installations of 2,300 volts and higher.

Trends in Substations—Generally speaking, we believe the trend in substation installations is toward more and smaller substations, although there is still a field for the application of large substations. This problem is largely one of economics, depending upon transmission and distribution voltages, tempered, of course, by the requirement of maintaining some sort of emergency service in case of substation transformer failures. The principle of the factory-built substation idea appears to be sound, since it tends toward standardization, but is largely applicable here to substations requiring installation on the ground. In pole-type installations it appears to be too expensive.

Practices Adopted Recently—Several changes have been made in our practices which tend to improve service. Such things as arrester interconnection and new-sequence metering—together with a host of minor changes in the type of hardware and pole fixtures used and the manner in which they are assembled—all have contributed toward a better standardization of our practices and will eventually result in lower operating and maintenance costs and improvements of service.

Many systems, no doubt, have a multiplicity of voltages that are unnecessary, but exist as a result of the way the system grew. Elimination of unnecessary transformations should result in decreased costs and improved regulation, so that any system in this condition should be given thorough study.

An increased use of multiple street lighting is desirable in densely settled areas, because it is frequently more economical than series lighting in such sections. This decision, of course, depends on economics and should be made only after a thorough study.

Suggestions for Improvement—Standardization of fuses, so they will be interchangeable in all cutouts, is needed. Some improvement in this respect has been made by manufacturers, but considerable can still be done to embrace repeating fuses as well as one-time fuse. Improvement of the operating characteristics is also desirable, to attain greater selectivity. Eventually, standardization of fuse cutouts to permit interchangeability of fuse holders would be desirable, but this equipment has not yet attained perfection and should be further improved. Pole-type automatic reclosing circuit breakers seem to be a step in the right direction, if the cost does not prove prohibitive compared with repeating fuses.

Starting characteristics of the smaller motors should be improved to reduce light flicker. Improvement of contactors for controlling multiple street lighting is particularly desirable. Use of circuit breakers, instead of fuses, in customers' installations should be pushed by power companies. Meter manufacturers should develop one meter for residential use, instead of the ten or twelve types, now employed around the country.

Combines Beauty and Utility in Auditorium Lighting

By A. L. POWELL
Supervising Engineer,
Incandescent Lamp Department,
General Electric Company

SOME unusual and fascinating new applications of light involving both new sources and new means of utilizing flux have been made in the "House of Magic," General Electric's conference room in New York City, that may presage radical changes in theater and auditorium lighting.

Most striking is the effect produced in the auditorium proper, where the ceiling is brilliantly painted with light in red, green and blue, giving purple, blue-green, orange and yellow where the primary colors overlap. Despite this color lighting, the illumination at the seat level is white, so there are no disagreeable, unnatural or distorted effects, such as when one color is used. The color lighting is so strong that it is not washed out when the cove lighting, unusual in its design, is brought up to full brilliancy. Extraordinarily interesting shadow effects are produced because the different color lights originate from separate sections of the ceiling. Fringed color-shadows, embodying the primary and secondary colors, prevail everywhere, giving fascinating and intriguing effects.

The ways in which these lighting effects are produced are equally interesting. Lighting was influenced by several features of the layout and finish. The space is rectangular, about 46 ft. from the projection room, and is divided by rather large columns on 14-ft. centers into a foyer 10 ft. wide and a seating area 18 ft. wide. The maximum ceiling height is 12 ft. The foyer ceiling is black and broken by two circular coffers for air conditioning. The ceiling proper is white and around all four sides of this a ledge or shelf is dropped the distance of 1 ft.

It was desired to keep the foyer ceiling as dark as possible and to have no visible light sources and no pendant luminaires. Accordingly on each of the three columns were placed partially recessed light-directing boxes. The exposed section takes the form of three triangular prisms, the sides of which toward the rear are of metal painted to match the column. The opposite faces are fitted with Holophane prismatic "Controlenses." The light from 100-watt Mazda lamps is bent away from the ceiling, refracted toward the opposite wall and lights the space indirectly. The luminaires are decidedly inconspicuous and there is no distracting glare.

The two long ceiling coves in the seating area were fitted with a continuous reflector by the Garden City Plating & Manufacturing Company, which has a total of 56 30-watt Mazda tubular "Lumiline" lamps. The new construction of this lamp gives the effect of a practically continuous light source which is necessary when such a shallow depth of cove is employed. This cove lighting is controlled by the thyratron-reactor system and can be delicately adjusted to any level of illumination desired.

Suspended from the center of the ceiling is a trough fixture two feet wide in which there are seven 120-volt hot-cathode, gaseous-conductor lamps, totaling about 2,800 watts, and their control equipment produced by the

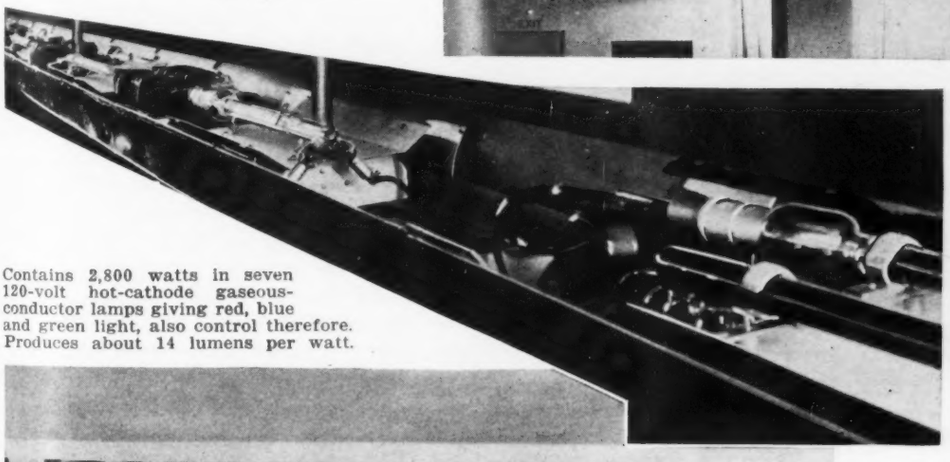
General Electric Vapor Lamp Works. It would require more than 20 kw. to produce the same amount of colored light with Mazda lamps.

The trough, whose exterior is of gunmetal mirrored glass, was designed and manufactured by the A. Ward Hendrickson Company. Two of the lamps for producing red light are neon-filled and of clear glass 1 in. in diameter and 18 in. long; two, for producing green light, are mercury-filled with yellow glass for screening out the the blue flux and are 1 in. in diameter and 50 in. long, bent to U shape; three, for producing blue light, are mercury-filled with blue glass for screening out the green flux and have the same length, diameter and shape as the preceding.

Lamps are arranged in the following order: Blue, red, green, blue, green, red, blue. The cathodes are connected in multiple to a separate circuit which also controls a time-delay relay. This prevents the establishment of the arc before the cathodes are up to full emissivity. Each color is on a separate circuit.

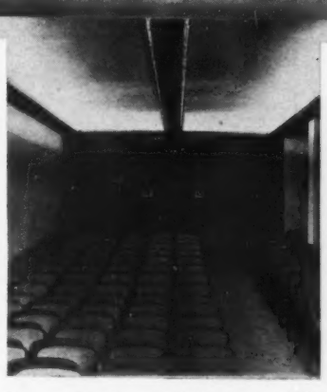
For producing colored light it is most logical to use gaseous-conductor sources rather than Mazda lamps, from which the flux not desired must be screened out or absorbed. For instance, the neon tube produces red light at approximately 14 lumens per watt, whereas a Mazda lamp of the same size would produce it at less than five lumens per watt. The mercury lamp with screen emits green light at approximately seven lumens per watt, as against green light from the Mazda lamp at less than three lumens per watt. The mercury lamp with a screen produces blue light at approximately eight lumens per watt, against a fraction of a lumen per watt from the Mazda lamp.

Stage lighting is accomplished from a built-in pocket in front of the curtain. This contains a strip-light reflector, by the Frink Corporation, equipped with the following: Twelve 75-watt thyratron-controlled lamps, four 50-in. mercury-vapor standard tubes, two 18-in. hot-cathode neon tubes, and, for the demonstration of luminescent effects, three 50-in. mercury tubes with black or dark purple glass for screening out the visible radiation and transmitting the near ultra-violet. There are also two 1,000-watt lens spots. Hood & Fouilhoux were the architects.



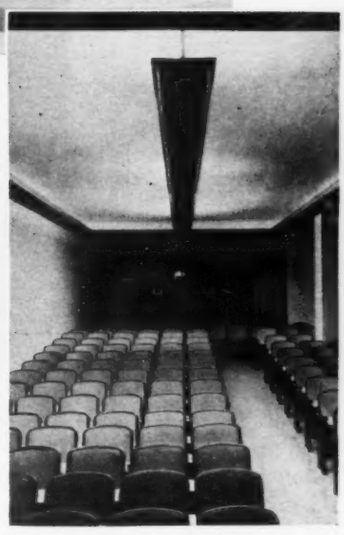
Looking in top of ceiling trough

Contains 2,800 watts in seven 120-volt hot-cathode gaseous-conductor lamps giving red, blue and green light, also control therefore. Produces about 14 lumens per watt.



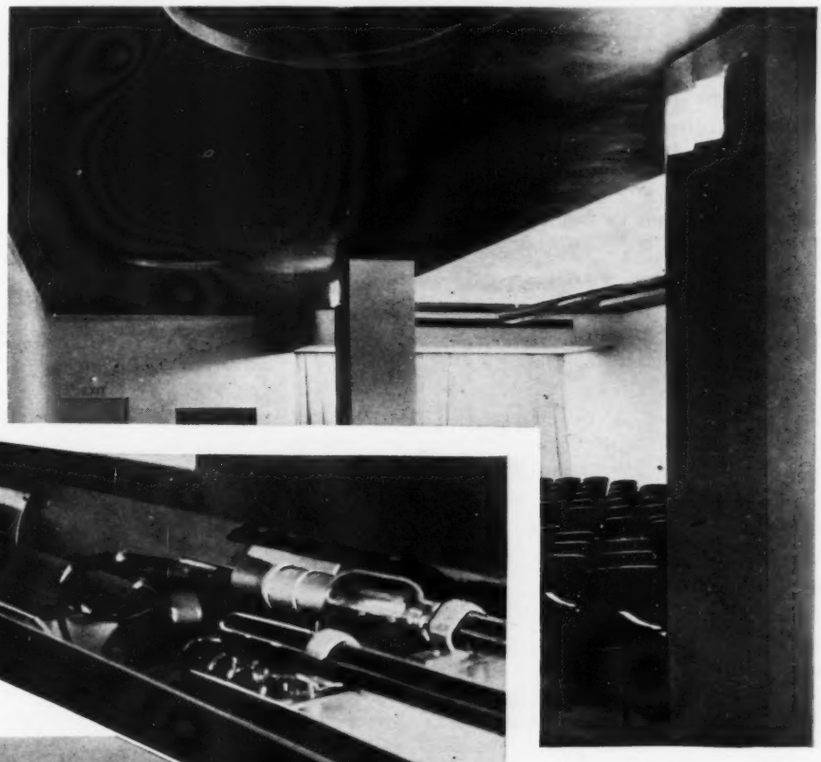
Built-in lighting pocket in front of stage curtain

Contains thyratron-controlled Mazda lamps, seven mercury-vapor lamps, two neon tubes and two spot lamps.



Ceiling is painted with vari-colored light but white light prevails at seat level

Note ceiling trough that produces red, green, blue, purple, blue-green, orange and yellow illumination on ceiling and cove lighting using "lumiline" lamps with thyratron-reactor control.



Inconspicuous glareless foyer lighting that could illuminate wall tapestry or murals

Note lighting units on columns

Use of High-Voltage Motors

Electric current as supplied by practically all of the public utility companies from their substations to industrial plants is delivered at voltages ranging from 2,200 to 13,500 or higher. Question arises as to the extent to which it may be practical to connect the motors of a plant directly on the primary voltage and thus dispense with the losses which are incurred in the secondary transformers and at the same time to reduce the required capacity of the conductors by which the motors are supplied with current. A number of factors must be taken into consideration before such a step is undertaken, including the following: Apparatus available for use on high voltages, the rulings of the National Electrical Code, those of the local authorities governing such installations, and the comparative cost of high-voltage installation as against that of low-voltage.

By GEORGE H. HALL
Consulting Engineer, New York

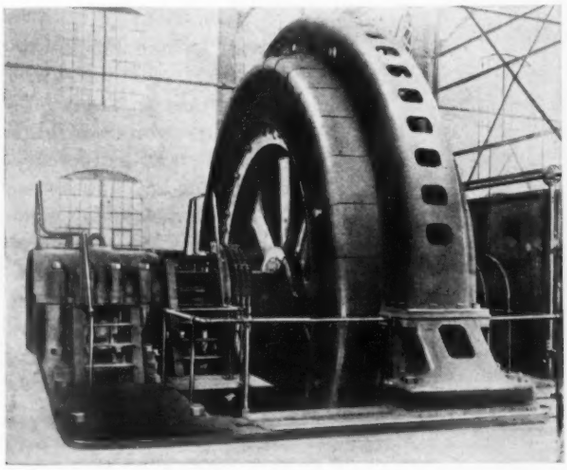
MOTORS to operate on high voltages must be constructed with specially insulated windings properly to protect them against grounds and short circuits which will occur in case of insulation failure. However, this involves design which need not concern the plant engineer, since the limitation of motor voltage is established by the rulings of the National Electrical Code: "Motors operating at more than 7,500 volts between conductors shall not be installed elsewhere than in central stations and substations and in fire-resistive motor rooms." While special large motor installations may, and frequently do, warrant the construction of fire-resistive motor rooms, the foregoing clause limits the general use of high-voltage motors to those covered by the standard ratings of 660, 2,200, 4,400 and 6,600 volts.

Polyphase motors for use on these standard high voltages are regularly manufactured in the same types as for the low voltages. Squirrel-cage motors are made for both full-voltage and reduced-voltage starting, but, wherever conditions permit, the use of full-voltage for starting is preferred in view of the less complicated starting devices that may be employed.

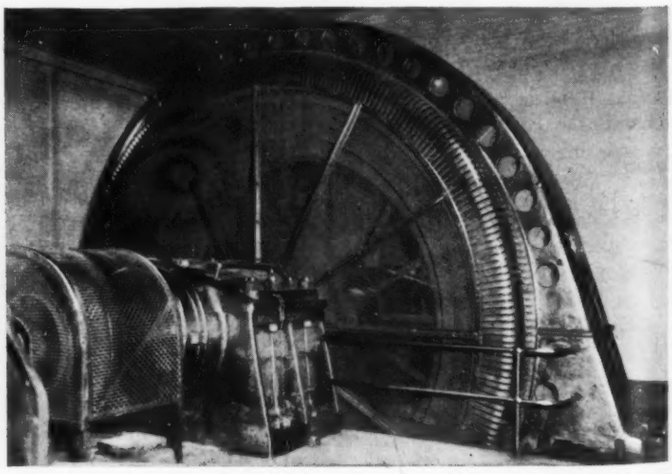
Slip-ring, or wound-rotor, motors are used for variable speed requirements and for heavy starting duty. Since only the primary winding carries the high voltage all secondary control is handled at voltages below 660, and therefore no high-voltage complications are introduced in the control of this type of motor. The slip-ring motor on high voltages is employed largely in tube, strip and rolling mills, where heavy starting duty is encountered or where variation in speed is needed.

The motor most generally employed on high voltages is the synchronous type. As the field excitation of these motors requires low-voltage direct current the only portion of the synchronous motor subjected to high voltage is the stator windings. The characteristics of the synchronous motor admirably suit it for use on all kinds of heavy mill work wherever the starting demand is not sufficiently high to require the use of slip-ring motors. It is also particularly adapted for use as the driving unit of motor-generator sets due to its maintenance of constant speed under all load conditions within its capacity. Thus in many types of mills in which the driving demands of rolls or other machines make the use of direct current desirable the alternating-current service to the plant is transformed into direct current by the use of a motor-generator set consisting of a high-voltage synchronous motor direct connected to a low-voltage direct-current generator.

While the cost of making small mo-



Westinghouse Electric & Manufacturing Company
7,000-hp., 6,600-volt squirrel-cage induction motor driving a 160-in. universal plate mill



General Electric Company
9,000-hp., 6,600-volt synchronous motor driving a continuous bar mill

tors for use on high voltages would be so high as to be practically prohibitive, we find that as the capacity of the motor increases its adaptation to the higher voltages becomes more practicable. Also, while the saving in copper used in the lines from which the motors are fed would be offset by the increased cost of installation for the smaller capacity units, when the size of the motors increases the saving in copper in the lines soon becomes a governing factor in making the employment of high-voltage motors desirable.

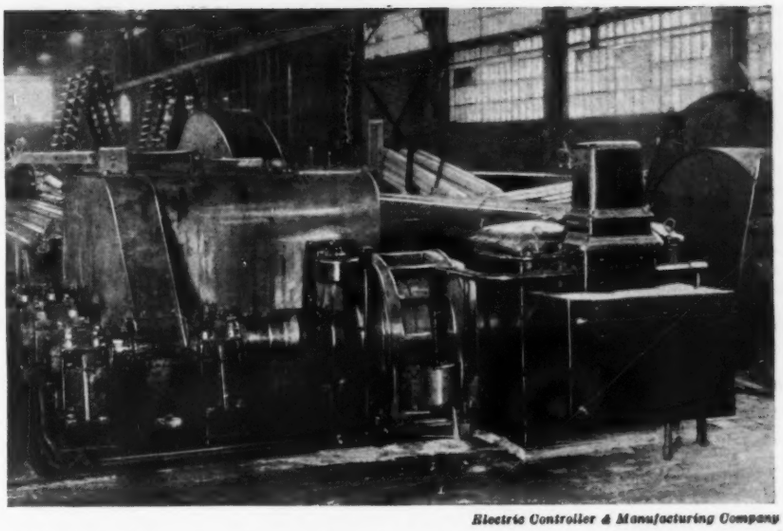
Although it is impossible to set limits that will be applicable to all classes of installations, it may be generally stated that the use of high-voltage motors in ratings below 100 hp. is seldom of advantage. From this up to 500 hp. the choice will lie between the high and low voltages, with an increasing proportion of cases in favor of the high voltage. Above 500 hp. the choice is generally in favor of the high voltage, while from 1,000 hp. up to the largest sizes built we seldom, if ever, find any but high-voltage ratings.

Controllers operate under oil

Controllers for use with high-voltage motors are in general similar to those used for low voltage, with the fundamental difference that all circuit-breaking contacts must be operated under oil. For squirrel-cage motors designed for full-voltage starting a manually operated oil switch is sufficient or a magnetically operated oil switch may be used. Such switches must be equipped with overload and no-voltage protection. The control voltage is provided by the use of a potential transformer which permits all control current to be handled at low voltage, usually 110 or 220 volts. The low voltage release is usually of the time-delay type, so that if an interruption of circuit does not exceed about 1½ seconds the operation of the motor will not be interrupted. These accessory devices for the primary switches apply as well to those used with slip-ring and synchronous motors.

For use with slip-ring motors either a manually or magnetically controlled oil switch is used for the main lines, or primary leads to the motor, while the secondary control, handling low voltage only, employs a drum or other form of resistance adjusting controller. The secondary control is interlocked with the primary switch so that it will close only when the secondary controller is on the "full resistance" point. When a drum controller is used with a magnetic line switch the first point of movement of the drum handle closes the control circuit to the magnetic switch and causes it, in turn, to close the line, after which the steps of resistance are successively cut out by further movement of the drum handle. After the motor has been stopped it can be started again only by swinging the drum handle back to the first, or line-closing, point. With the full-magnetic controller the same functions are automatically performed in proper sequence when the "start" button is depressed.

Synchronous motors may be started on either full or reduced voltage by the use of automatic or semi-automatic controllers similar to those employed for low voltage. As this type of motor is used mainly in the larger sizes the use of the full-automatic controller is to be recommended. With the semi-automatic controller, in the use of which the motor may be transferred from reduced voltage to full voltage before it has reached its maximum speed, abnormal peaks of torque and current may be caused. In some cases this may not be objectionable and the cost of the semi-automatic controller is considerably less than that of the full-automatic. On the other hand, we are sure of avoiding such possible causes of trouble by the use of the full-automatic controller, in which the transfer from reduced to full voltage



Electric Controller & Manufacturing Company

Full-automatic, reduced-voltage synchronous motor starter for high voltage

General Electric Company

Safety, truck-type switchgear for high-voltage use

Wire Insulation for High-Voltage Installations

Size of Conductor	Volts: 1,500	2,500	3,500	5,000	7,000
	Thickness of Insulation in 64th In.				
Rubber-Covered Wire					
14-8	6	8	10	12	16
7-2	7	9	10	12	16
1-0000	8	10	10	12	16
225,000-500,000 circ. mil.	9	10	11	12	16
525,000-1,000,000 circ. mil.	10	10	12	12	16
Over 1,000,000 circ. mil.	10	10	12	14	18

Size of Conductor	Volts: 1,500	2,500	3,500	5,000	7,000
	Thickness of Insulation in 64th In.				
Varnished-Cambric-Covered Wire					
14-10	5	..	..	..	..
8-2	5	7	8	11	14
1-0000	6	7	8	11	14
225,000-500,000 circ. mil.	6	8	9	11	14
525,000-1,000,000 circ. mil.	7	8	9	11	14
Over 1,000,000 circ. mil.	8	9	9	11	14

is accurately governed by a motor-operated transfer relay. The full-automatic starter has also the advantage of permitting remote control, which is not accomplished by the semi-automatic controller.

Selection of starters

In the choice of full- or reduced-voltage starting consideration should be given to the following conditions:

(a) Is the motor built to withstand full-voltage starting and to furnish sufficient torque to meet the load requirements?

(b) Is the full-voltage starting current within the limits permitted on the line?

(c) Are the connections between the motor and the load—that is, the belt, coupling or other form of connection—suited to withstand the application of full-voltage torque?

If these conditions are not fully met reduced-voltage starting should be employed or the conditions changed to meet them. In some cases an alteration in the motor, the connections or the driven machine may be effected at a cost that will be less than the difference between that of the full-voltage starter and that of the reduced-voltage starter.

Usually it will be found that the full-voltage starters will be suited for use with low-speed motors, while the reduced-voltage starters will be better suited for use with high-speed machines.

Special control usual on high voltages

Final selection of any large motor and its control should be reached only after all of the details have been thoroughly reviewed by both the motor and the controller manufacturer.

To meet the requirements of safety, high-voltage controllers of all kinds are mounted in steel cabinets or cases, or else installed in separate fireproof cells, so that they may be controlled from the outside of such inclosures, and that access to any part while it is carrying high-voltage current will be impossible.

In accordance with the code, all high-voltage motors must be protected by oil circuit breakers and the main line from which they are fed must also be provided with a similar breaker. These breakers must be equipped with overload protection and the breaker by which the main line is controlled must have sufficient interrupting capacity to handle the maximum current that may be encountered in case of a short circuit. Just what this interrupting capacity will be depends upon the capacity of the generating plant by which the service is supplied. This is usually determined by the utility company supplying the service, but it will in any case bring the main breaker within the class of "high interrupting capacity" breakers, resulting in a comparatively high cost.

The other breakers, those that protect the individual motors, need not be of as high interrupting capacity so long as the main breaker is provided with instantaneous overload trip and the individual breakers are furnished with time-delay trips. Then, in case of a short circuit, even if it occurs beyond an individual breaker, the main, or high interrupting capacity breaker, will open before the time-delay trips allow the individual breaker to do so.

A further code requirement is that between each oil circuit breaker and the supply line there shall be installed a set of air-break disconnecting switches so that in case of repair or other work being necessary on the breaker it may be entirely disconnected from the line. When installed outside of cells or cubicles they are to be placed at a height which permits them to be opened only by the use of a switch hook, which must at all times be kept at some easily accessible point near them.

Oil circuit breakers and switches must be isolated from other switches and apparatus, and where they are connected to circuits exceeding 2,500 volts to ground they must be placed in fireproof cells or metal compartments. This ruling is complied with by the use of safety truck panels or armor-clad switchgear units. When mounted on rollers withdrawal disconnects from the service only that particular circuit served by the truck. Besides the partition through which the contacts project are automatically closed so that access to the live bus is impossible. Before a truck can be drawn out, or return to place, the circuit breaker must be in the open position, thus insuring that no part of the equipment shall be carrying current except when the truck is in its "full in" position.

Special wiring requirements

"All wiring of circuits of more than 600 volts shall consist of approved grounded metal-sheathed cable inclosed in rigid conduit or duct" (N.E.C.). While this is the general ruling, an exception may be made in cases where the cable is not exposed to moisture, when the metal sheath may be omitted if such omission is approved by the inspection department. Where moisture is present not only is the metal sheath required, but at splices the sheath must be belled out and the splices bonded around by No. 6 copper wire and ground clamps. The use of armored cable is not approved for systems of more than 600 volts.

In addition to the regulations governing the use and installation of high-voltage apparatus in industrial plants as established by the National Electrical Code, there are other regulations fixed by the various local inspection bureaus. Whenever a high-voltage installation is contemplated all such local rulings should be carefully investigated.

Low Rate and High Revenue

Load Factor Definitely Influences Revenue per Kilowatt of System Demand—Off-peak Water Heating Helps Diversity

ANALYZING the influence of load factor upon rates for different classes of use, Russell G. Warner, electrical engineer of the Connecticut Public Utilities Commission, has recently* given informative data about the experience of the utilities of that state. Selecting typical rate schedules, he first showed how rapidly the rate drops as the load factor is improved by increasing consumption at fixed demand (Fig. 1). The influence of diversity in household appliance use was shown by Fig. 2, in which the daily load factor of the composite load is 56.2 per cent and without the water heating load would have been 38.4 per cent. The highest peak with the water heating occurs during the night and in terms of the day peak the load factor would be 61.8 per cent. Had this water heating been supplied by 500-watt heaters with only thermostatic control the day peak would have been about 22 kw. and load factor about 52.5 per cent.

These data are from tests made by the Hartford Electric Light Company on a Saturday in February on a 15-kva. transformer supplying 27 single houses. These customers had 22 refrigerators, eleven ranges and eight time-controlled water heaters, with lighting and miscellaneous appliances totaling about 230 kw. of connected load. The annual load factor at this transformer was 48 per cent.

Date were also presented to show the relation between value of home, yearly consumption, yearly bill and average earned rate for some all-electric homes in Hartford. Another item of interest covered by Mr. Warner was the relation between load factor and the revenue per maximum kilowatt of system demand experienced by some eighteen large and small utilities in Connecticut. The smallest utilities have the poorest load factor and the highest revenue per kilowatt of demand because of the prevailing higher rates.

*Excerpts from paper presented before recent conference of state utility commission engineers at Washington, D. C.

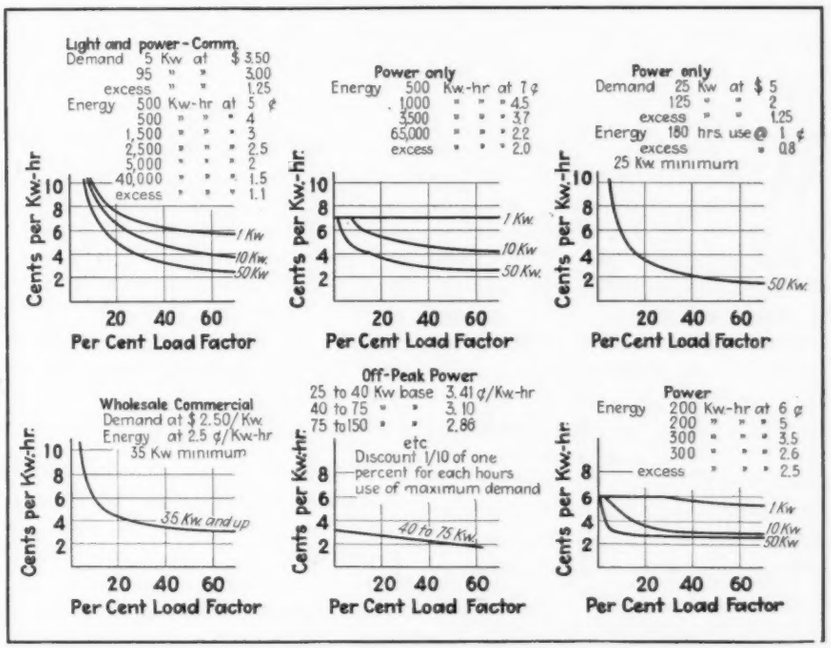

Light and power - Comm.
Demand 5 Kw at $3.50
95 " " 3.00
excess " " 1.25
Energy 500 Kw-hr at 5 ¢
500 " " " 4
1,500 " " " 3
2,500 " " " 2.5
5,000 " " " 2
40,000 " " " 1.5
excess " " " 1.1
Power only
Energy 500 Kw-hr at 7 ¢
1,000 " " " 4.5
3,500 " " " 3.7
65,000 " " " 2.2
excess " " " 2.0
Power only
Demand 25 Kw at $5
125 " " 2
excess " " 1.25
Energy 180 hrs. use @ 1 ¢
excess " 0.8
25 Kw minimum
Wholesale Commercial
Demand at $2.50/Kw.
Energy at 2.5 ¢/Kw-hr
35 Kw minimum
Off-Peak Power
25 to 40 Kw base 3.41 ¢/Kw-hr
40 to 75 " " 3.10
75 to 150 " " 2.86
etc
Discount 1/10 of one percent for each hours use of maximum demand
Power
Energy 200 Kw-hr at 6 ¢
200 " " " 5
300 " " " 3.5
300 " " " 2.6
excess " " " 2.5
Cents per Kw-hr.
Per Cent Load Factor
1 Kw.
10 Kw.
50 Kw.
35 Kw. and up
40 to 75 Kw.

Fig. 1—Form of rate determines influence of load factor on average unit charge

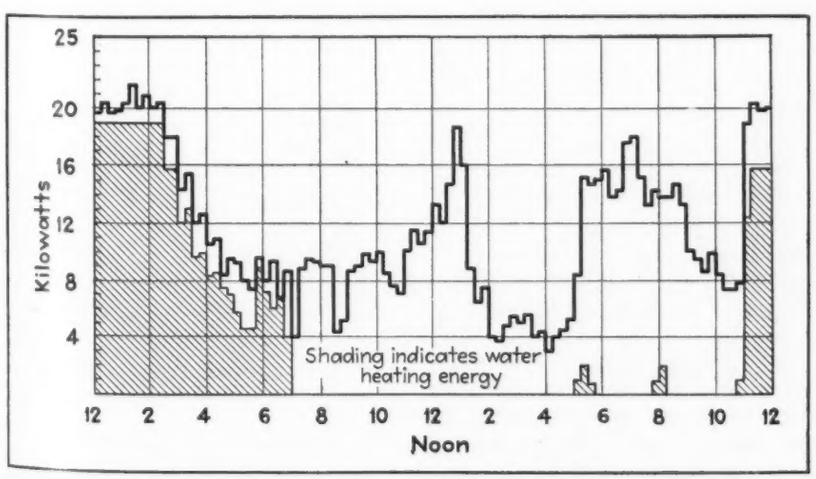


Fig. 2—Off-peak water heating boosts load factor from 38 to 56 per cent
This is the composite load of 27 Hartford residences with 22 refrigerators, eight water heaters and eleven ranges on a 15-kva. transformer.

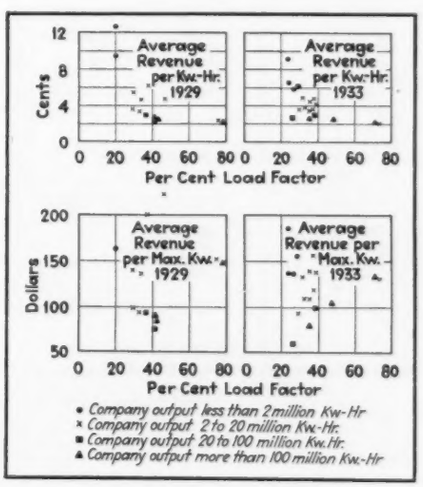

Cents
Average Revenue per Kw-Hr. 1929
Average Revenue per Kw-Hr. 1933
Per Cent Load Factor
Dollars
Average Revenue per Max. Kw. 1929
Average Revenue per Max. Kw. 1933
Per Cent Load Factor
• Company output less than 2 million Kw-Hr
× Company output 2 to 20 million Kw-Hr.
■ Company output 20 to 100 million Kw-Hr.
▲ Company output more than 100 million Kw-Hr

Fig. 3—Better load factors raise returns on capacity investment

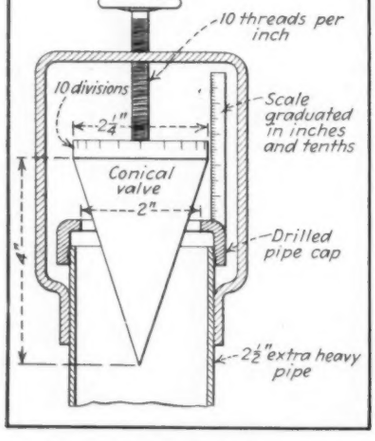
Venting Raises Hydro Output

Efficiency Increases Ranging Up to 30 per Cent or More Result From Breaking Vacuum in Low-Head Units at Part-Gate Openings

Some years ago it was discovered that the output of hydro turbines at small gate openings could be materially increased without corresponding increase in the amount of water required. This effect was accomplished by admitting air into the turbine casing. Although this is not new knowledge, sufficient experimental and operating data have not yet been assembled for it to be said that all of the factors are catalogued and documented. This article by a hydraulic engineer presents information in a field heretofore unexplored.

By C. J. McLEAN
Hydro Engineer,
Illinois Northern Utilities Company,
Dixon, Ill.

WHEN a hydro-electric plant is carrying reduced load or when water flow is low, making necessary the operation of turbines at gate openings of 0.5 or less, then an appreciable increase in output can be made by "venting" or the admission of air into the turbine casing. This expedient is not new when operating hydro generators as synchronous condensers for voltage regulation and power-factor correction. But the available information on the effect of venting has mostly referred to medium and fairly high-head installations. Little or no data have been offered on low-head machines. Therefore results of tests at the low-head plant of the Illinois Northern Utilities Company on the Rock River at Dixon, Ill., are presented.



Graduated air-admission valve
This valve was designed and built for use in the test after the general shape of the air-admission efficiency curve had been determined by the fixed orifices. By means of this valve the amount of air entering the turbine can be closely regulated and measured.

Nature of tests

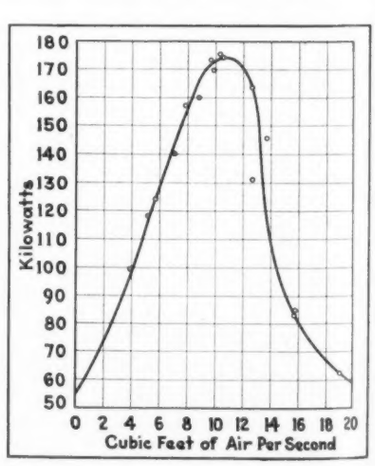
Tests were made with heads varying from 8.2 to 8.4 ft. For results to be comparable, the water velocity was adjusted, in each case, to an 8.5-ft. head by assuming that the velocity would vary as the square root of the head. The output was adjusted by assuming that it would vary as the 3/2 power of the head. The head covers of the turbines are equipped with four openings, each tapped for 2½-in. diameter pipe and normally sealed with standard pipe plugs. The first test was made by closing the turbine gate to 0.35, at which point the output of the generator was practically zero. One plug was removed and the power output became 55 kw. With two plugs removed the power dropped to 28 kw. and with three plugs out the power was 22 kw.

Turbines at the plant had never been calibrated, so no exact knowledge was available as to the quantity of water used by them. An Ott current meter was placed in the head race, ahead of the trash racks, as an index meter. There was no indication of an increase in the water velocity with the increased output so long as the gate opening remained unchanged. Therefore it was assumed that the volume of water utilized was constant. There was a definite indication that, with the proper volume of air admitted to the turbine, the increase would be a maximum.

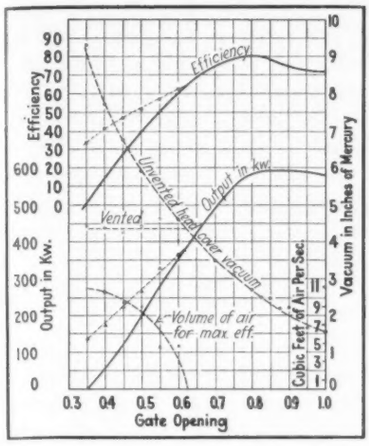
Next short lengths of extra-heavy pipe were inserted in the head-cover holes so they could equipped with a series of orifices, of graduated sizes, made from metal washers. These were devised so they would fit over the ends of the short pipe sections which had been turned true in a lathe. To minimize air leakage the orifices were seated in a putty-like compound. Vacuum in the turbine was measured with a mercury column. With a curve showing the amount of air passing through a certain diameter orifice for different vacuums, the total volume of air entering the turbine was computed for each set of orifices.

Observations made

With the turbine gates set at 0.4, the volume of air admitted was varied



Too much air reduces efficiency
The curve of air admission plotted against kilowatt output at a fixed gate opening is pretty well peaked, indicating fairly critical quantity of air for best efficiency.



Air admission raises output and efficiency

For gate openings up to 0.625 the volume of air for maximum efficiency ranges downward to zero from about 11 cu.ft. per second. The effect of admission of this most effective quantity of air is to maintain the head-cover vacuum fairly constant at about 4½ in. of mercury, while the efficiency improvement ranges downward from over 30 per cent and the increase in output down from about 135 kw. at the lowest point of gate opening tested.

by using combinations of orifices in the head-cover openings. The investigations made show that the number of points at which the air is admitted apparently has little to do with the additional output obtained. The factor that controls is the volume of air admitted. Similar tests were run for other gate openings with results which are quite similar.

Without venting, the head-cover vacuum decreases as gate opening is increased. For all gate openings at which admission of air was beneficial the head-cover vacuum for best efficiency semed to be fairly constant at about 4½ in. of mercury. The sizes of orifices which gave best results decreased with increase in gate openings. From the data accumulated in the tests there appears to be no value in admitting air for gate openings above 0.625, in this particular case.

Having determined quite definitely that the volume of air and not the number of openings was the measure of the increased output, the adjustable valve illustrated was built. Any variation of head-cover vacuum and volume of air can be obtained by adjusting this valve.

While the gains from air admissions were considerable, the efficiency of the propeller-type turbine under part load is so low that operation at part gate is not to be recommended except when absolutely necessary. This is to say, that the increase in efficiency accomplished by air admission is not sufficient to compensate for the decrease in efficiency brought about by part-gate operation. Except that it can be said that venting does improve low-head turbine efficiency at part-gate opening, these tests at Dixon cannot be taken as conclusive.

Repairs 38-Kv. Live Line

Conductors at All Suspension Points Covered With Armor—Dampers Installed at Anchor Towers

By H. L. TALBOT

Manager Bolivian Power Company, Ltd., Oruro, Bolivia

SERIOUS breakage of conductor strands at suspension points has been experienced by the Bolivian Power Company on a 38-kv. transmission circuit consisting of No. 4/0 ACSR conductor supported from towers 600 ft. apart and feeding important tin mines in the Oruro plateau, 12,000 to 13,000 ft. above sea level. Dampers and conductor armors were not considered necessary at the time of building the line, but were found to be needed after a few years' operation due to conductor vibration.

As a single three-phase circuit was employed to serve these mines, working 24 hours a day and seven days a week, the line could not be deenergized for changes. However, as the line is operated at 38-kv. delta, although all equipment is designed for 66-kv. star with grounded neutral, it was found possible to operate one phase grounded while it was being repaired. At that time, armor rods were installed at all suspension points, whether broken or not, and Stockbridge vibration dampers at all anchor towers, where breakages were most apparent.

Several factors had to be considered before undertaking this work. For example, there were telephone interference, unbalance of voltage, method of grounding conductor to protect workmen, rupturing ground current and adapting the procedure to unskilled workmen, as the war had drafted all experienced linemen.

Telephone interference was an important problem because the company operates single-conductor ground-return telephone circuits serving the mines and other customers. To limit interference grounding of the delta 38-kv. line for repairs was confined to hours between 8 a.m. and noon and between 1 p.m. and 5 p.m. Later, experience showed that communication was not disrupted as badly as expected, although there was cross talk and a loud hum. Consequently conversation was limited to no more than two parties at once. The company's own metallic circuit paralleling the transmission for 80 miles suffered the most. It was so noisy it couldn't be used.

Unbalance of voltage and current, due to grounding, was not sufficient to cause complaint from motor users. Due to the limited repair periods, the effect on lighting was negligible. Transformers and generators did hum more.

To ground the circuits worked on, an air-break switch was mounted on a tower in the center of the first section to be repaired with a flexible lead for clamping on any phase wire. Difficulty in rupturing the ground current was minimized by performing this operation while there was still considerable load on the line—just before the noon dip, etc. A complication arose after the first four weeks, due to low water and the necessity of starting a Diesel plant at the load-end of the line,

putting power on both sides of the work section. Another air-break switch would have been desirable, but ground connections were made at each end of the work section with hot-stick conductor clamps. To avoid drawing a pronounced arc on application and removal, and thereby pitting of conductors, the lamp was attached to the conductor before grounding, contrary to the general practice.

Aids to men

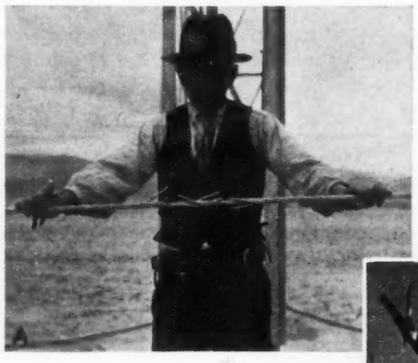
Adaptation of the procedure to inexperienced men involved some interesting departures. Each tower to be worked on was previously marked at the base with paint, the color indicating the phase to be handled. The color terminology was used in all instructions in identifying conductors to be worked on. Two or three four-man crews were distributed along the line at distances capable of being handled in one day. Each was equipped with a hot-stick conductor clamp, flexible cable and tower clamps, also an insulated wooden platform to set on the ground on which to work, two sets of light block and tackle, a light "bosun's" chair and rubber gloves. Some of this equipment is illustrated as it was employed in the carrying out of the work.

First, the air-break flexible conductor was attached to the phase to be repaired with a hot stick. Then the switch was closed. One man attached the blocks and tackle to the tower arm; another man was raised in the bosun's chair into proximity of the insulator where he attached the second tackle for supporting the conductor. The ground crew pulled up the conductor, while a man in the bosun's chair released the conductor and suspension ear. The conductor was lowered so two men on the insulated ground platform could apply armor rods. After this was done the previous procedure was reversed. Where a truck could be used to move equipment, it was provided with an insulated platform to speed the work. Since the middle phase could not be lowered to the ground, the repair men were equipped with rubber boots and worked from the upper cross-member of the tower.

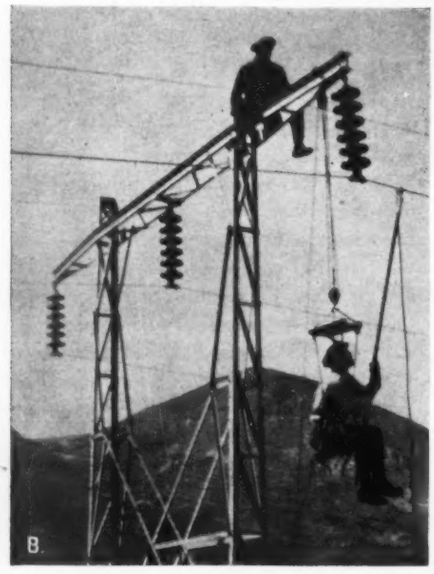
Speed of work

Dampers were installed in a similar manner. With the aid of a boat hook, a tower man attached to the conductor beyond the strain insulators the tackle used to haul up a man in a bosun's chair. Grounding of the conductors was done by a tower man who attached the ground clamp to the jumper across the strain insulators.

Speed of repairs done in this way is indicated by the fact that the first section (30 miles) was finished in four weeks with only two crews. Without the truck, one crew could armor one conductor on fifteen towers in one day. The center conductor required more time because it couldn't be lowered.


A

Some Steps in Applying Conductor Armor and Dampers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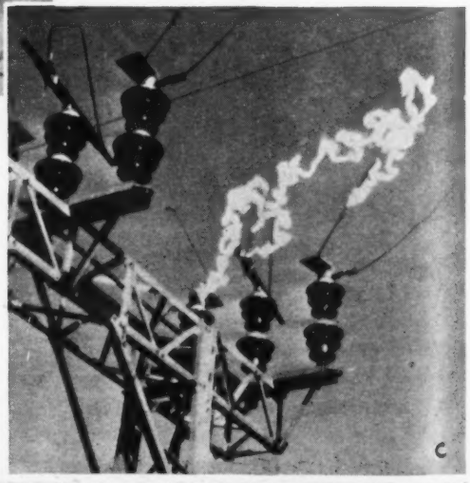
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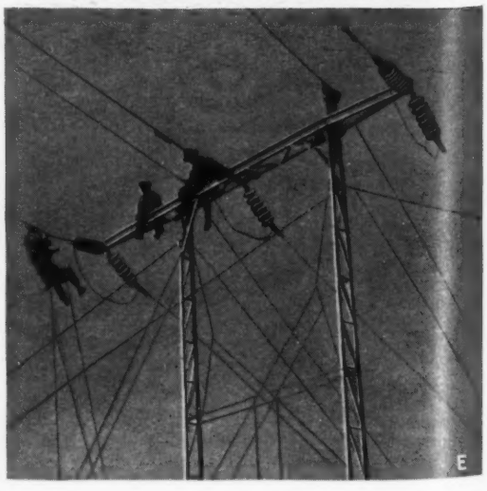
E

(A) Epidemic of broken conductor strands led to live-line repairs.
(B) Attaching ground wire to phase before repairing.
(C) Air-break switch used to ground phase-wire before repairing.
(D) Installing armor on lowered conductor while standing on insulated platform. Although no accidents occurred with this platform, due to grounding of conductor, some additional precautions might be advisable. For example, guarding workmen on ground from lowered conductor, making it impossible for a workman to step off or onto the platform, or preventing contact of men on the ground and on platform.—[Editor].
(E) Installing vibration damper at anchor tower.

Machines Don't Last Forever

Replacement of Electrical Equipment Has Been Less Than Sufficient to Take Care of Obsolescence— An Expedition Into Statistics Brings the Evidence

IN 1914 the total generator capacity in the power plants of public utilities, manufacturing establishments and mines and quarries was about 13,000,000 kw. Five years later it was 18,300,000 kw. The average rate of increase was somewhat over 1,000,000 kw. annually. Detailed figures are given in the accompanying table.

The reason for going back to 1914 is that twenty years may be taken as a reasonable retirement age for such machinery. If 1,000,000 kw. was being added annually between 1914 and 1919, then 1,000,000 kw. is annually coming to age 20 between 1934 and 1939.

Replacements short by 400,000 kw.

But only half of this equipment is being replaced. The rest is still in service, to the extent, at least, of being included in the figures for rated capacity. For evidence we refer to the returns of the Census of Manufactures for 1931, the latest published. Converting those figures that are reported in kva. on the assumption of 0.8 power factor, the total of a.c. and d.c. generators manufactured in that year was 1,128,000 kw. Ignoring the probably negligible additions in manufacturers' power plants, deduction must be made for net additions to utility plants. These exceeded 500,000 kw. in 1932. They greatly exceeded this amount in 1931, but to be conservative it may be assumed that generators put into operation in that year were largely manufactured in 1930. That leaves about 600,000 kw. for replacement—a deficit of 400,000 kw.

Similar computations for motors show that, 20 years ago, installations were growing at an annual rate of 1,813,000 hp. To this should be added the horsepower in elevators and other stationary motors. The amount is unknown, but an approach may be made by way of the Census for 1914. In that year motors aggregating 2,883,000 hp. were manufactured. Replacements at that time probably did not exceed 300,000 hp., making net additions around 2,600,000 hp.

In the Census of Electrical Manufactures for 1931 horsepower statistics are incomplete. Including items that have been estimated the total of motors manufactured in that year approximates 3,000,000 hp.

If the 2,600,000 hp. was replaced there remains only 400,000 hp. for new installations, or not much more than 1 per cent of the total existing motor power for manufacturing and mining. This is scarcely enough, even in a depression year like 1931. Factory construction was indeed curtailed, but it did not by any means come to a dead stop. The introduction of new processes and the making of new products did not utterly cease. There were whole groups of industries, like food products, that suffered only a slight change of tempo. These uses could readily absorb many thousands of horsepower though no statistics can be quoted.

To sum up for 1931:

(a) Manufacture of generator equipment fell far short of obsolescence requirements.

(b) Manufacture of motors was perhaps sufficient to permit replacing those 20 years old.

(c) With generators goes switching equipment, transformers, instruments, motor drives for auxiliaries and other electrical equipment, as well as the steam or hydraulic plant. With it also goes the transmission and distribution equipment corresponding to an annual growth of 600,000 customers, 20 years ago.

(d) With motors goes control equipment, switches, power transformers.

(e) Since the total of replacements of machinery, which can be measured, fell short of covering obsolescence, it is probable that other equipment also fell short. That is, the $1,000,000,000 of electrical machinery and supplies manufactured in 1931 did not fully cover replacements of 20-year old equipment of all kinds.

Deficiency is increasing

Now for 1932 and 1933. The value of electrical manufactures for those years was less than in 1931. The estimates are $635,000,000 and $750,000,000 respectively. Equipment was aging at the same rate as in 1931.

Deferred replacements running into hundreds of millions of dollars of electrical equipment are only awaiting the rising industrial demand and the ability to finance the necessary purchases. In the industrial field modernization should afford opportunities to analyze present methods and in many instances to improve the power load.

Installed Capacity in 1914

	Generator Kw.	Motor Hp. On Purch. Energy	Motor Hp. On Private Power
Public utilities.	9,370,000	.....	400,000
Manufacturing	3,200,000	3,897,000	4,939,000
Mines, quarries	490,000	700,000	900,000
Totals.....	13,060,000	4,597,000	6,239,000

Installed Capacity in 1919

Public utilities.	13,094,000	.....	850,000
Manufacturing	4,530,000	9,375,000	6,970,000
Mines, quarries	685,000	1,603,000	1,259,000
Totals....	18,309,000	10,978,000	9,079,000

Average Annual Increase, 1914-1919

Public utilities.	745,000	.....	90,000
Manufacturing	266,000	1,095,000	406,000
Mines, quarries	49,000	180,000	72,000
Totals....	1,060,000	1,275,000	568,000
Total motor.		1,843,000	

One of a Series of Intimate Talks with Industry Executives

Davidson on Family Relations

An Interview by

EARL WHITEHORNE

A GOOD many years ago a story came out of the West that aroused a lot of interest. It was the expression of a new spirit of customer service that impressed every power company man who heard it.

This Western company had equipped its trouble men with motor cycles. When a night call came that Mrs. Jinks was giving a party and her lights were out, one of these service men came roaring up the street within five minutes, probably, and gave them light. Then the master touch was applied. The service man went immediately to the nearest pay station and telephoned the office, whereupon the sweet-voiced girl, who had already sympathized with Mrs. Jinks in her predicament and promised quick help, called back and said: "Has our man come yet? Oh! I'm so glad! Isn't that splendid!"

Mrs. Jinks didn't know that *she* knew that the job was already done. She was touched by the girl's eager interest. She was deeply impressed with the spirit of the service that the power company gave its customers. It was the friendly touch that did it.

This happened in Omaha. It was J. E. Davidson's idea of the way to make friends for electricity. It is a fine example of the close personal flavor of the relationship that he has always maintained with the communities where he has operated the power service—years ago in Montpelier, Vt., then in the state of Oregon, and for a long while as president of the Nebraska Power Company. I think he has as great a gift for making friends and winning favor for his company through personal popularity as any utility executive I have known.

And so, because this matter of friendship and confidence has become so vital to the future of the power systems of America, I asked "Jim" Davidson the other day for his present point of view toward the job that must be done by the entire power industry to create public sympathy and support. He said: "It all gets down to the simple fundamentals of a friendly relationship. Every merchant, every successful business organization goes out of its way to be courteous, cordial and helpful to its good customers. But because a power company has so many customers it is hard for many of our people to think of them this way—as individuals, each of personal importance to them. But it is the key to the rebuilding of our public relations.

Treat customers as home visitors

"The attitude of the organization is a primary element in the success or failure of any company selling light and power service. I have said many times that if an electric utility company has a franchise in a good market it will have no difficulty in obtaining money with which to build the very best power station, transmission and distribution system—in other words, physical property. However, that is only the beginning. The organization is the most important factor in the successful operation of that physical property. It is the heart and soul—it is that "something" that makes real going concern value—and the plant, including all physical property, is nothing but the bare bones.

"I believe that some utility companies have not been successful, or as successful as they might be, because from the top man down they do not have the right make-up to serve their fellow-men. In a word, the executives must be 'well bred.' And from this statement you may think that I am building a family instead of a business organization. In fact, that is just what I am doing. I believe that all the members of a utility organization must, in their contacts with the public, treat them, day in and day out, just as they would treat them in their homes—socially. They must be thoughtful, considerate, cordial, courteous and polite, and, of course, handle each customer's wants with dispatch.

"I tie the executives and employees together, because as the executives are, so are the employees. And even though an employee may work in the power station, be a lineman or a truck driver, he is bound to come in contact with the public, and his attitude when on duty and off duty must be not only satisfactory, but must be appealing—in fact, stand out with individuality. If so, it builds friendship for the employee's company.

"A man cannot be a fault-finder, discourteous, thoughtless, unappreciative or have other such negative characteristics at home and then come down to work and treat the public with which he does business with a manner that will be winning. A man or woman who works for a utility company must be the kind naturally who gives at all times the kind of service that makes friends. And so breeding counts and should be given great consideration in hiring both men and women."

"But," I said, "to so many men this all sounds like platitudes. They believe in this theory, but really take no action."

"There's where the trouble lies!" Davidson replied. "The principle is useless unless it is made effective by policies and performance. Every power company in the country would do well right now to make a serious study of the attitude of its organization toward the people it serves. The board of directors should check on the president. The president should see that every executive and employee is appraised for this quality. And every man whose attitude is wrong should be corrected or eliminated. Friendship and courtesy must be capitalized or public service fails."

JAMES EDWARD DAVIDSON, president Nebraska Power Company, is an enterprising utility executive who not only bases his management policies on satisfying customers but serves as a leader in developing commercial and human relations policies for the entire industry. He has a notable record at home and in the industry.

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The President on Utilities

PRESIDENT ROOSEVELT has sent a message to Congress calling for the regulation of public utilities. While not directly indorsing the Wheeler-Rayburn bills, he says they "incorporate many of the recommendations" of the National Power Policy Committee report. By inference only, and not by the contents of his message, he supports these destructive and ill-advised bills that strike at the foundations of both holding and operating companies. The definite recommendations in his message do not agree with the destructive provisions in these bills.

He says holding companies should not profit from their dealings with subsidiaries where there is no semblance of actual bargaining to get the best value and the best price. He says a management company should operate on a fee basis and should not own stock in its client companies. In his opinion the holding company should not establish a sphere of influence from which independent engineering, construction and other private enterprise is excluded. Yet he states that if a management company is controlled by related operating companies it should be organized on a truly mutual basis and perform its services at actual cost demonstrably lower than the services can be obtained in a free and open market. Many of these principles are now in operation. They are not the destructive elements in the Wheeler-Rayburn bills.

Mr. Roosevelt is positive in his statement that "where the utility holding company does not perform a demonstrably useful and necessary function in the operating industry, and is used simply as a means of financial control," it should be abolished. In this connection he states that "except where the holding company is absolutely necessary to the continued functioning of a geographically integrated operating utility system the utility holding company with its present powers must go." He believes in the divorcement of the two functions of an investment trust and a management company for subsidiary properties.

This message of the President will be taken by many as propaganda for the Wheeler-Rayburn bills. And it is. But it also states definitely and for the first time his ideas about holding and operating utilities. The points he makes should be the basis for the development of constructive Congressional legislation to modify the destructive provisions of the Wheeler-Rayburn bills. The utilities should consider the points he makes. There is a basis for Congress and the utilities to get together. They should study this message with this idea in view, for it is the sensible thing to do. All cards can be put on the table and a constructive agreement reached. The government and the utilities should be partners, not enemies. The utility business is vital to national welfare. It should not suffer from the inevitable destruction that would come during the warfare that would occur as the consequence of the passage of the unmodified Wheeler-Rayburn bills.

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Insulation Control Improves Service

DURING the long history of electrical engineering ways have been found to meet every emergency threatening the stability of power utility service. The precision of electrical test methods has constantly been a vital factor in analyzing the fitness of material and equipment for specific duties. Thus, an epidemic of line insulator failures occurring shortly after the war and an onset of bushing troubles a few years ago stimulated the development of testing apparatus and techniques which have done much to prevent breakdowns and to increase the engineer's knowledge of insulation at work in outside plant as well as indoors.

Until very recently any "good" one-piece insulation unit has presented a well-nigh impenetrable wall to accurate grading in the field by portable instruments. Such insulation has appeared to be completely non-conducting; *i.e.*, of infinite resistance, when measured outside the shop or laboratory. The development of the power-factor, watts-loss method of testing for field applications has provided a recognized means of diagnosing and grading the condition of oil circuit breaker and transformer bushings, internal parts of breakers, stack insulators and short sections of cable. This approach is also aiding engineering scrutiny of insulating liquids and windings of machinery. A large body of data upon permissible insulation tolerances as interpreted from precision tests in the field is being accumulated.

While it is very difficult to evaluate progress in insulation control resulting from improved methods of field investigation, the economic gain is unquestioned. The utility engineer's objectives as to insulation are dual: (1) To insure highly reliable service, and (2) to reduce his insulation investment nearer to the minimum feasible level than that set by former factors of safety. Practice has now gone beyond merely forestalling innumerable insulation breakdowns. It has reached a stage where the co-ordination and interpretation of field

tests and studies point the way toward a deeper comprehension of designing, manufacturing and operating problems allied with the production and use of insulation. Among the valuable fruits of this work are the putting of reconditioning, replacement and maintenance on a more scientific basis resulting from the instrumentalities available to engineers carrying the heavy responsibilities of modern utility service.

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Makers Should Encourage Consultants in System Surveys

SALES representatives are energetic again, trying to persuade system managements, both utility and industrial, to invest in newer and better apparatus which improve service and save operating money. The small operator admits he needs some of these things, but cautious hesitancy often prompts him to turn a deaf ear to all proposals just because he is bewildered by the maze of suggestions offered him. That is a situation subversive to what should be proceeding in the direction of rehabilitation. What management should have is a comprehensive picture of the whole problem of rehabilitation with first things standing first in the list. Large manufacturers can, of course, give this kind of service, but it is very expensive, and when they do so they encroach on the legitimate province of the broad-gage and competent consulting engineer. The smaller specialty producer, however, is placed at an unfair disadvantage in this kind of sales competition.

One manager of a small system knows that his property has grown without much regard to planned sense. He knows that consumers will not use increased consumption at decreased rates unless he can give the quality and continuity of service they have learned to expect. Generous and occasionally conflicting claims of apparatus salesmen leave him perplexed as to where to begin. Begin he is going to, unperturbed by the boat-rocking of the pilots on the Potomac. He is no engineer, so he engages two—one to tell him what he should do and another to check and double-check on the relative merits of every improvement measured in terms of costs, profits and resultant consumer satisfaction. He is planning to spend and all he wants to know is where to spend first and best. He insists on abandoning fragmentary reconstruction based on opportunist sales suggestions. He demands that the full picture be given him, knowing that distribution is headed toward thoroughgoing overhaul. He believes he can profit handsomely from the sound advice of the impartial consultants.

This is a true short story. The book ought to be full of them. It would be if manufacturers would cooperate to encourage the system owner, especially the small one, to call in the consultant to supplement what operating and engineering talent he has working for him.

For the Self-Respect of Engineers

WITHDRAWAL of the $19,000,000 that was allocated by P.W.A. for the construction of the Rio Verde power and irrigation project in Arizona uncovers a situation that is a stench in the nostrils of engineers who respect themselves and their profession. This project was reported unfavorably by U. S. Reclamation engineers in 1919, 1920 and 1927. It received no consideration from P.W.A. until an Arizona delegation, under the leadership of Senator Henry F. Ashurst and Congresswoman Isabella Greenway, carried the matter to President Roosevelt. Following that, the Commissioner, U. S. Bureau of Reclamation, submitted a report "respectfully recommending" that $18,912,000 be allocated to the project. And now the allocation has been rescinded because, in a few words, the cost was grossly underestimated and the promised accomplishment grossly overclaimed.

It is to the credit of the reclamation engineers that, after "respectfully recommending" under political pressure, they discovered, not too late in this case, that they had more respect for themselves than for politicians.

Apparently this Rio Verde episode was about the weirdest of all the hare-brained undertakings of an administration firmly committed to "back-platform engineering." Report after report asserted that water was not available for the project and that the problematical power could find no market. Having now demonstrated, by blocking this project, that politics can be licked, the engineer should now turn his attention to the next on the list.

Casper-Alcova undoubtedly will be next. Secretary Ickes has frequently announced that the P.W.A. policy is to approve projects "which are self-liquidating within a reasonable period." The optimism with which the Secretary allotted $12,000,000 as a start on the cost of this "self-liquidating" project was beautiful indeed when it is considered that reclamation engineers have stated that the income per acre to the government from the completed project could not possibly be more than $2 per year. On this return the liquidation of the cost of the project is variously estimated at from 150 years to eternity. Here also the power market is conspicuously deficient.

Gaining confidence as it eliminates the most patently imbecile of the irrigation and water-power projects proposed to, or undertaken by, the government, the engineering intelligence of the nation can go on to question the more plausible of such schemes if any such remain when the craziest have been put out of the way. Then, and only then, can the engineer hold up his head in self-respect. Certainly he cannot be honest with himself so long as he allows politicians to force him to submit reports "respectfully recommending" projects he knows are unsound, uneconomic and in denial of common sense. An engineering committee could tell the truth about these projects.

Easing of Holding Company Bill Recommended by Healy of S.E.C.

At hearing on Wheeler-Rayburn measure he proposes modification of curbs — Seavey of Federal Power Commission testifies on Water-Power Act — N.E.M.A. makes plea for utility industry

Continuing his testimony on the holding company bill before the House interstate and foreign commerce committee, Judge Robert E. Healy contended that it was not the function of the Congress to undertake to preserve the inflation values of utility holding company stocks. Questioned as to whether electric rates had gone up as a result of holding company growth and domination of the operating companies, Judge Healy admitted that they had not, but countered with the statement that neither had rates gone down as rapidly or as extensively, or as far as they might have, had holding companies not been in the picture. Again, as in practically every previous session, the Judge was challenged, step by step, by Representative Wolverton (R.) of New Jersey, by Representative Cooper (R.) of Ohio, by Representative Mapes (R.) of Michigan and others.

In concluding his testimony Judge Healy made several specific suggestions for the liberalization of the provision of Sec. 10 of the bill, which relates to the intended simplification of holding company structures and their elimination entirely by January 1, 1940. As drawn, his suggestions would give the jurisdiction of the ultimate legislation on the holding companies to the Securities and Exchange Commission; would provide, in effect, for a broader recognition of the rights of present security holders to some protection of their equities through a slower, more deliberate liquidation of holding companies over a period which, at the discretion of the commission, might extend considerably beyond 1940; would undertake an immediate correction of existing abuses by holding companies, if any remain, and would encourage the development of geographically and economically integrated operating companies on a well-defined regional scheme.

F. P. C. representatives testify

Testimony of Lester S. Ready, chief engineering consultant for the Federal Power Commission, on its national power survey and electric rate survey, took the form of an introduction of group of maps and charts, with accompanying explanations, which are to be part of the forthcoming first release on the National Power Survey.

At the following session testimony turned to Title II of the proposed legislation, with Federal Power Commissioner Clyde L. Seavey appearing to analyze the provisions of the section, particularly as they relate to the enlargement and the extension of the jurisdiction of the Federal Power Commission. The objective of Title II, Commissioner Seavey said, is to give protection and advantage to the consumers of electrical energy, and protection to those who invest in the securities of the utility industry. This objective, he continued, is to be accomplished by putting into effect the authority of the federal government in a regulation which is not now carried out—by supplementing state with federal authority and by co-ordinating both to secure a complete regulation of the industry.

Mr. Seavey's second appearance before the committee failed utterly to clarify the ambiguities of language with which the major provisions that relate to the amendment of the Water-Power Act as they appear under Title II are cloaked. Dozier A. DeVane, Federal Power Commission's solicitor, carefully outlined the purpose and extent of each of the proposed amendments and introduced a considerable amount of clarifying language in the form of amendments to the more confusing sections.

Opposition by state commissions

Several of the state commissions consider the bill as an unquestionable encroachment upon state rights which should be fought vigorously. As a group, opposition is to be made through the National Association of Railroad and Utilities Commissioners, which has prepared amendments to the proposed legislation which it will submit in the near future. Both the Connecticut commission and the Georgia commission have filed official protests against the measure.

Carl L. Peirce, Jr., president of Hubbard & Company of Pittsburgh, and vice-president of the National Electrical Manufacturers Association, has announced that a committee has been appointed to make a thorough study of the pending holding company bill, with instructions to prepare and present to the proper committees of Congress a statement urging that any legislation enacted dealing with this subject shall conserve the credit and the purchasing power of the electric light and power companies, and assure that they can extend their service to the public.

"A number of companies," a resolution recently passed by the board of governors of the association points out, "need added equipment to enable them to give service to the public. This is in the direction of the increased capital goods production which is so much needed by the electrical manufacturing industry—capital goods and the heavy industries being the most severely depressed and in which the largest amount of unemployment still continues. If this can go forward a large number of people will be called back to work, but it can only be accomplished if the public utility program is placed on a stable basis so that the management of these companies may have confidence, the investing public may be relieved of the uncertainty and new financing may be successful."

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Owen D. Young Makes Plea for Better American Homes

Speaking over a National Broadcasting Company network last week, Owen D. Young, chairman of the board of the General Electric Company, expressed the opinion that "the most important challenge today to the ingenuity of the inventor, to the technology of the fabricator, to the wisdom of the financier, is to bring within the means of the average man a more comfortable and efficient home than now exists or can be produced at any cost."

"We have spent ourselves," Mr. Young said, "both our brains and money in the creation of great machines. Now let us turn that energy and experience to the building of the most important mechanism of human life, a modern American home. If that challenge be met, we shall take the most essential forward step, in providing social security in the United States." The broadcast was one of a series sponsored by the General Electric Company on behalf of the Federal Housing Administration.

T.V.A. Power Deal Annulled by Court

Judge Grubb voids Alabama Power property transfer contract — Agreement with Electric Home and Farm Authority also ruled out — Chattanooga votes for T.V.A. power

Following up his recent oral decision that the sale of electric energy by the Tennessee Valley Authority in competition with private utilities is illegal (ELECTRICAL WORLD, March 2, page 47), Judge W. I. Grubb in United States District Court in Birmingham has annulled the contract for the sale of certain properties by the Alabama Power Company to the T.V.A. The judge held the contract made January 4, 1934, "to be in furtherance of illegal proprietary operations by the Tennessee Valley Authority."

In the same decree Judge Grubb enjoined the Alabama Power Company from operating as an agency for the Electric Home and Farm Authority, Inc., a subsidiary of the T.V.A., through which electrical appliances were sold on long-term rates to purchasers. A third injunction contained in the order prohibited fourteen North Alabama towns and cities receiving energy from the Alabama Power Company from entering into or performing any contract with T.V.A. for the purchase of energy, either directly or indirectly. This injunction also prohibited the borrowing of funds from any federal agency to build a distribution system to obtain T.V.A. energy.

While the contract for the sale of certain of the utility's properties was annulled, Judge Grubb held that the construction of Joe Wheeler Dam was legal and prohibited the Alabama Power Company from seeking to recover the site either through suit or otherwise, or to interfere with work on the dam.

To safeguard electric service to municipalities and county associations now receiving energy wholesale from the T.V.A. the decree stated that the interchange agreement between the authority and the utility, a part of the annulled contract, should continue in force for four months after date of decree or final appeal. A further provision was made that the utility or T.V.A. could terminate the interchange agreement on giving ninety days' notice.

Counsel for the T.V.A. announced that an appeal would be carried to the Federal Court of Appeals.

Thirty cities and towns have formed themselves into the West Tennessee Association to make a mass effort to secure Tennessee Valley Authority power. Counsel for both sides in the Alabama suit stated that the decree did not affect the Mississippi and Tennessee Utilities.

Chattanooga voters at an election held March 12 approved a bond issue of $8,000,000 to finance a public power distribution system with T.V.A. energy. The vote was 19,291 to 7,901, which is more than two to one. J. C. Guild, president of the Tennessee Electric Power Company, in commenting on the results, said: "Naturally we are very much disappointed at the results of the election. The Tennessee Electric Power Company continues to serve the city of Chattanooga in the same efficient way as it always has."

COFFERDAMS TO HARNESS COLUMBIA RIVER

There is being staged a fast and exciting race to get this cofferdam in place before the melting snows of the western mountains raise the Columbia River to unmanageable heights. It is the first of a series of mighty cofferdams which will harness the Columbia River in central Washington, 92 miles west of Spokane.

Roosevelt Defends Utility Legislation

In vigorous message to Congress he backs Rayburn bill and attacks propaganda — Norris resolution adopted — Gadsden replies for utilities

Replying direct to the self-preservation campaign now being waged by public utility companies, President Roosevelt in a 1,200-word message delivered last Tuesday urged Congress to legislate along the lines of the Wheeler-Rayburn bill, hearings on which are being held before the House interstate and foreign commerce committee. The message accompanied a report on holding companies prepared by the National Power Policy Committee.

Within a few hours after the message was made public spokesmen for the utilities issued statements in reply. Dr. Hugh S. Magill, president of the American Federation of Utility Investors, expressed partial agreement with the views of President Roosevelt on the need of reorganizing holding companies, but scored the Wheeler-Rayburn bill as "the autocratic assumption of federal domination and for the wrecking of the utility industry in utter disregard of the Constitution and the rights of the several states."

"We are astonished at the President's message on the holding company bill," Dr. Magill stated, "particularly because of the wide difference between what he says in his message and what the pending Rayburn-Wheeler bill provides. The President makes a very plausible argument in support of the regulation of holding companies with which practically every one will agree. However, the real effect of his message is to advocate the passage of the Rayburn-Wheeler bill, which is one of the most autocratic and destructive measures ever introduced in Congress.

"The President declared that he is not impressed by the petitions of literally hundreds of thousands of investors who would be directly affected by the passage of this bill. Nor does he seem to be impressed by the undeniable fact that the value of utility securities has actually declined more than $100,000,000 since this bill was introduced in Congress on February 6.

"These tremendous losses are not theoretical, but real. They fall not on the companies which the bill proposes to wipe out, but upon millions of innocent investors. The fact that such losses on the part of such a vast number of worthy citizens does not impress the President seems to indicate a state of mind that listens to the Brain Truster but coolly disregards the pleas of the people in the exercise of their constitutional right 'to petition their own gov-

ernment for a redress of grievances'."

"The issues are simple," read a statement issued by Philip H. Gadsden, chairman of the Committee of Public Utility Executives. "Shall all public utility holding companies be ruthlessly destroyed without trial or hearing? Shall innocent investors everywhere throughout the country have their investments destroyed to further an untried and Utopian scheme of economic reform? Shall we go many steps beyond fair and adequate governmental regulation and put the electric industry of the country completely in the hands of a new bureaucracy at Washington?

"The President has stated that 'if we could remake our financial history in the light of experience, certainly we would have none of this holding company business.' That statement apparently eliminates from any further consideration the great achievements made possible by the holding company in every major American industry. Most of the basic products which the American public buys come from holding companies.

The destruction of the holding company, as has been provided in the proposed bill, is no longer a concern for the public utilities alone, but for all industry."

A resolution calling for an investigation into propaganda against the Wheeler-Rayburn bill was introduced by Senator George W. Norris of Nebraska and promptly adopted by the Senate without debate.

President Roosevelt's Utilities Message

I am transmitting to you herewith a report submitted to me by the National Power Policy Committee. I named this committee last summer from among the departments of the government concerned with power problems to make a series of reports to coordinate government policy on such problems. This report I am submitting to you is the recommendation of the committee with respect to the treatment of holding companies in the public utility field. It deserves the careful attention of every member of the Congress.

The so-called Public Utility Holding Company Bill (Title I of House Bill 5423 and of Senate Bill 1725), which was drafted under the direction of Congressional leaders, incorporates many of the recommendations of this report.

I have been watching with great interest the fight being waged against public utility holding company legislation. I have watched the use of investors' money to make the investor believe that the efforts of government to protect him are designed to defraud him. I have seen much of the propaganda prepared against such legislation — even down to mimeographed sheets of instructions for propaganda to exploit the most far-fetched and fallacious fears.

I have seen enough to be as unimpressed by it as I was by the similar effort to stir up the country against the Securities Exchange Bill last spring. The Securities Exchange Act is now generally accepted as a constructive measure and I feel confident that any fears now entertained in regard to proposed utility holding company legislation will prove as groundless as those last spring in the case of the Securities Exchange Act.

Says values will not be hit

So much has been said through chain letters and circulars and by word of mouth that misrepresents the intent and purpose of a new law that it is important that the people of the country understand once and for all the actual facts of the case. Such a measure will not destroy legitimate business or wholesome and productive investment. It will not destroy a penny of actual value of those operating properties which holding companies now control and which holding company securities represent insofar as they have any value. On the contrary, it will surround the necessary reorganization of the holding company with safeguards which will in fact protect the investor.

We seek to establish the sound principle that the utility holding company so long as it is permitted to continue should not profit from dealings with subsidiaries and affiliates where there is no semblance of actual bargaining to get the best value and the best price. If a management company is equipped to offer a genuinely economic management service to the smaller operating utility companies it ought not to own stock in the companies it manages and its fees ought to be reasonable.

The holding company should not be permitted to establish a sphere of influence from which independent engineering, construction and other private enterprise is excluded by a none too benevolent private paternalism. If a management company is controlled by related operating companies it should be organized on a truly mutual and cooperative basis and should be required to perform its services at actual cost demonstrably lower than the services can be obtained in a free and open market.

We do not seek to prevent the legitimate diversification of investment in operating utility companies by legitimate investment companies, but the holding company in the past has confused the function of control and management with that of investment and in consequence has more frequently than not failed in both functions. Possibly some holding companies may be able to divest themselves of the control of their present subsidiaries and become investment trusts. But an investment company ceases to be an investment company when it embarks into business and management. Investment judgment requires the judicial appraisal of other people's management.

Would keep essential companies

The disappearance at the end of five years of those utility holding companies which cannot justify themselves as necessary for the functioning of the operating utility companies of the country is an objective which Congressional leaders I have consulted deem essential to a realistic and far-sighted treatment of the evils of public utility holding companies.

For practical reasons we should offer a chance of survival to those holding companies which can prove to the Securities and Exchange Commission that their existence is necessary for the achievement of the public ends which private utility companies are supposed to serve. For such companies, and during the interim period for other companies, the proposal for a comprehensive plan of public regulation and control is sound.

But, where the utility holding company does not perform a demonstrably useful and necessary function in the operating industry and is used simply as a means of financial control, it is idle to talk of the continuation of holding companies on the assumption that regulation can protect the public against them.

Regulation has small chance of ultimate success against the kind of concentrated wealth and economic power which holding companies have shown the ability to acquire in the utility field. No government effort can be expected to carry out effective, continuous and intricate regulation of the kind of private empires within the nation which the holding company device has proved capable of creating.

Except where it is absolutely necessary to the continued functioning of a geographically integrated operating utility system, the utility holding company with its present powers must go. If we could remake our financial history in the light of experience, certainly we would have none of this holding company business. It is a device which does not belong to our American traditions of law and business. It is only a comparatively late innovation.

Assails state chartering

It dates definitely from the same unfortunate period which marked the beginnings of a host of other laxities in our corporate law which have brought us to our present disgraceful condition of competitive charter-mongering between our States. And it offers too well-demonstrated temptation to and facility for abuse to be tolerated as a recognized business institution. That temptation and that facility are inherent in its very nature.

It is a corporate invention which can give a few corporate insiders unwarranted and intolerable powers over other people's money. In its destruction of local control and its substitution of absentee management it has built up in the public utility field what has justly been called a system of private socialism which is inimical to the welfare of a free people.

Most of us agree that we should take the control and the benefits of the essentially local operating utility out of a few financial centers and give back that control and those benefits to the localities which produce the business and create the wealth. We can properly favor economically independent business, which stands on its own feet and diffuses power and responsibility among the many, and frowns upon those holding companies which through interlocking directorates and other devices have given tyrannical power and exclusive opportunity to a favored few.

It is time to make an effort to reverse that process of the concentration of power which has made most American citizens, once traditionally independent owners of their own businesses, helplessly dependent for their daily bread upon the favor of a very few, who, by devices such as holding companies, have taken for themselves unwarranted economic power.

I am against private socialism of concentrated private power as thoroughly as I am against governmental socialism. The one is equally as dangerous as the other; and destruction of private socialism is utterly essential to avoid governmental socialism.

Drastic Rate Base Slash Urged by New York Power Authority

$450,000,000 recommended to Governor Lehman as fair figure for New York City electric system — Rate pact on inflated basis opposed — Carlisle assails report — Committee hearings continue

In a special report made last week to the Governor and the Legislature the Power Authority of the State of New York maintained that a fair rate base for the combined electric utility properties in New York City would be approximately $450,000,000, or $279,000,000 less than that suggested to the Public Service Commission recently by Floyd L. Carlisle, head of the Consolidated Gas System.

Work on the report was started early last year, when the Authority began gathering facts as a basis for negotiations of contracts for the distribution of power to be developed by the St. Lawrence hydro-electric project.

Warning that to permit a merger of the companies in the group into a giant operating company or the institution of the Washington plan of progressive rate reductions, without wiping out water and other inflations, would be to perpetuate high rates in New York City, the authority declared the system has made $172,000,000 in excess profits since 1907, computed only on the basis of the "water" that was put into the capitalization when the original mergers were made.

Carlisle fights valuation cut

Taking exception to the findings of the authority, Mr. Carlisle charged that the report was full of "great and obvious errors." He dwelt particularly on the allowance in the report of only $16,000,000 for working capital, asserting it would be impossible to meet payrolls, taxes and operating expenses with less than $40,000,000. "The statement of the Power Authority," Mr. Carlisle said, "utterly ignores the fact that since 1907—a period of 25 years—these companies have been completely regulated by the State of New York. . . . The Power Authority further seems to infer that no reduction in rates would be possible unless a very large decrease in the rate base were made. The experience of Washington was quite different. . . . I sincerely hope that the main objective of lower rates and greater use of our electric service will not be delayed or prevented by the confusion of various government agencies created and existing for different purposes, each trying to solve the matter in some different way. . . ."

In the meantime the hearings before the joint legislative committee were continued at Albany. Figures presented by J. Jay Dougherty, chief accountant for the committee, were presented to show that regulation of the rates of the Consolidated Gas Company by the Public Service Commission, together with legal expenses, adds over a million dollars a year to the utility bills of New York City consumers. Land write-ups were charged to the Westchester Lighting Company, a subsidiary of the Consolidated Gas Company, at the hearings. Purchases of real estate were included in the company's rate structure at greatly inflated value, according to the testimony, and certain officers of the company, it was disclosed, made large individual profits for their parts in the transactions.

Mr. Carlisle announced that the meeting of Consolidated stockholders to act on ratification of a resolution covering the merger plans will be adjourned for thirty days, since the Legislature has not passed the necessary acts. The Public Service Commission has also adjourned to March 27 the hearings on the applications made by the Consolidated system for an increase in electric rates as a result of the city utility taxes.

A long conference of federal, state and city officials was held late last week with Henry Morgenthau, Jr., Secretary of the Treasury, in New York. Mayor La Guardia headed the city delegation, which also included Maurice P. Davidson, Commissioner of Water, Gas and Electricity, and Corporation Counsel Paul Windels. Frank P. Walsh, chairman of the State Power Authority; Basil Manly, vice-chairman of the Federal Power Commission; Rear Admiral Reuben E. Bakenhus, Public Works officer for the Third Naval District, and Herman Oliphant, general counsel for the Treasury Department, were also present. Mr. Morgenthau said the conferees had discussed, among other matters, the recent proposals made to the government and the city by electric subsidiaries of the Consolidated Gas System for substantially lower rates for building and street lighting. At a luncheon of the City Affairs Committee in the Hotel Commodore following the conference Mr. Davidson and Mr. Walsh urged the establishment of municipal electric plants as the most effective method of reducing rates.

Following the hearings on the Westchester utility, the Senate, with the approval of John J. Dunnigan, chairman of the joint legislative committee, approved a resolution directing the committee to determine whether the Public Service Commission had been guilty of "inefficiency, neglect of duty or misconduct." A sum of $13,500,000 retained on the company's books drew the committee's fire.

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Utility Tax and Johnson Bill Considered Constitutional

The federal 3 per cent tax on electricity sales and the Johnson measure defining jurisdiction of district courts in utility rate cases are constitutional, in opinions of Newton D. Baker and James M. Beck reported to Thomas N. McCarter, president of Edison Electric Institute.

Whatever may be said as to the wisdom of policy of the Johnson law, the opinion states, "we cannot see any legal ground upon which it could be declared invalid as in violation of the Constitution." The 3 per cent tax, the opinion held, is within power of Congress with the minor and remote exception of electrical energy transmitted to a foreign nation.

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Municipal Plant for Albany?

At a public hearing on the proposed formation of a public utilities commission in the city of Albany, N. Y., Mayor Thacher signed the document authorizing appointment of such a body whose powers include the sale of $10,000,000 bonds for the construction of a municipal power plant and for its operation, if the voters approve. John L. Haley, vice-president of the New York Power & Light Corporation, and Neile F. Towner, chairman of the Albany Board of Water Supply and a stockholder of the company, protested the city's entering the electric power business. Although the measure the Mayor signed gives him the power to select a commission which would become effective July 1, he said he would not name the members until after the November elections, when voters will decide whether they want a local plant.

COMING MEETINGS

National Fire Protection Association—Electrical Committee, biennial meeting, Electrical Association of New York rooms, 46th Street and Lexington Avenue, New York, March 19-22. V. H. Tousley, secretary, Electrical Committee, 612 North Michigan Avenue, Chicago, Ill.

Electrochemical Society, Inc.—Spring meeting, New Orleans, La., March 21-23. Dr. Colin G. Fink, secretary, Columbia University, New York.

American Institute of Electrical Engineers—Southwest District, Oklahoma City, Okla., April 24-26. H. H. Henline, national secretary, 33 West 39th Street, New York.

Missouri Association of Public Utilities—Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, assistant secretary, 101 West High Street, Jefferson City, Mo.

Insull Investors Fight Bankers

Debenture holders bring suit to recover stocks put up for loans — Samuel Insull acquitted in embezzlement case

In behalf of 23,000 investors who put $60,000,000 into the debentures of the now bankrupt Insull Utility Investments Corporation, a suit was started last week before Judge Julian W. Mack in the federal court in New York against five leading banks in New York City and the General Electric Company for the recovery of approximately $30,000,000.

Together with five banks in Chicago, where an identical suit for approximately $50,000,000 is pending, the New York defendants are charged with emptying the portfolio of the investment company and getting possession of the stocks of the Insull operating companies, which they still hold. The complaint charges that the investors were led to believe that they were protected by a clause in the debentures prohibiting Samuel Insull from pledging more than half of the contents of the portfolio into which they had put their money. Nevertheless, in a succession of loans, during 1930 in Chicago and during the following year in New York, Mr. Insull borrowed from the defendants and bought more stocks in the belief that prices would soon go up and his utility system would be strengthened.

Loans admitted by defendants

Admission was made by the defendants of loans to Mr. Insull until he had put up the last of the stocks held by the Insull Utility Investments Corporation, when it was decided that a receivership was inevitable. Officers of several of the banks who were called upon to testify denied any knowledge of the restrictive clause.

Samuel Insull was acquitted on March 12 of a state embezzlement charge in Judge Cornelius J. Harrington's Cook County Criminal Court in Chicago. Mr. Insull was charged with taking $66,000 from the Middle West Utilities Company in 1932, when he was chairman, to bolster the brokerage account of his brother, Martin, then president of the company. The defense was that Samuel Insull was motivated by a desire to save the company rather than for profit to himself or his brother. The Insulls still face state charges of embezzling from the Mississippi Valley Utilities Company and a federal indictment against Samuel Insull charging violation of the Bankruptcy Law is pending.

Middle West case continued

Federal court hearings in Chicago on the Middle West Utilities Company reorganization have been continued to March 25, at which time any further objectors will be heard. Petitions asking reorganization of Arkansas-Missouri Power Company and Missouri Public Service Company, subsidiaries of the Inland Power & Light Corporation, under sections 77A and 77B of the Bankruptcy Act have been approved by Federal Judge Sullivan, who set March 19 for further hearings and left the companies temporarily in possession of their properties.

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Ontario Hydro Contracts Declared Illegal

Reviewing the Ontario hydro situation as his contribution to the Throne Debate before the Ontario Legislature, Hon. A. W. Roebuck, Ontario Attorney-General, branded power purchase contracts negotiated by the Ontario Hydro-Electric Commission with the Gatineau Power Company, Beauharnois Power Corporation and the Maclaren-Quebec Power Company as "illegal, unenforceable and void." Invoking sections of the British North American Act in his attack, Mr. Roebuck declared the contracts were illegal because they involved the construction of works and undertakings which connected one province with another or extended beyond the limits of a province. "It is beyond the legislative jurisdiction of the Province of Quebec to create corporations capable of constructing works connecting the provinces, or extending beyond the limits of the province. This is a function of the Dominion Parliament and can be delegated to a corporation only by that Parliament. The acts in these agreements are equally beyond the corporate powers of the three companies involved and of the Hydro-Electric Power Commission."

The Hydro Commission had a deficit for the fiscal year 1934 of $3,500,000, and the reserves, which in 1931 stood at $14,631,000, had by the end of 1934 dropped to $6,526,000. "Hydro affairs are in a condition that is far from normal," he said. "Hydro has been grossly mismanaged. Stupidity or worse has characterized the conduct of its affairs. The public advantages of cheaper power have in this way been outrageously sacrificed and Hydro today in its largest and most important division is faced with a crisis in which both courage and wisdom will be required to save it from disaster."

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Electrical Workers Join Cuban General Strike

Employees of the Compania Cubana de Electricidad, Havana, an affiliate of the Electric Bond & Share Company, New York, quit their jobs this week, joining the general strike in Cuba which has tied up the island's commercial, industrial and administrative activities. Three shifts, however, are being kept at the main power plant under military guard to insure light and water for the city.

•

New Utility Legislation

Utility measures continue to play an important part in the legislative program under consideration by the various state legislatures. A measure has been introduced in the Connecticut House which would place all municipal plants under the control of the Public Utilities Commission and would make them subject to the same statutory supervision, regulation and control as similar private corporations or companies engaged in public service work.

Indefinite postponement was voted by the Indiana House on a measure exempting all municipal utilities from taxation. A favorable committee report was made on a bill which would permit municipalities to condemn and acquire public utilities without obtaining authority from the Public Service Commission.

Municipally operated electric, water and gas plants would be subjected to a 2 per cent tax on their gross receipts under the terms of a bill introduced in the Pennsylvania House, increasing the utilities gross receipts tax from 8 mills to 2 per cent. Heretofore municipal utilities have been specifically exempted from any tax under the 8 mills levy law.

The bill ordering Massachusetts power companies to furnish free lamp renewals to their customers (ELECTRICAL WORLD, March 2, page 48) has been killed by the Senate.

By a vote of 31 to 19 the New Jersey House passed a bill to permit municipalities to borrow federal funds for building of publicly owned power plants. The law was desired by Camden, the voters already having approved a proposed $6,000,000 plant.

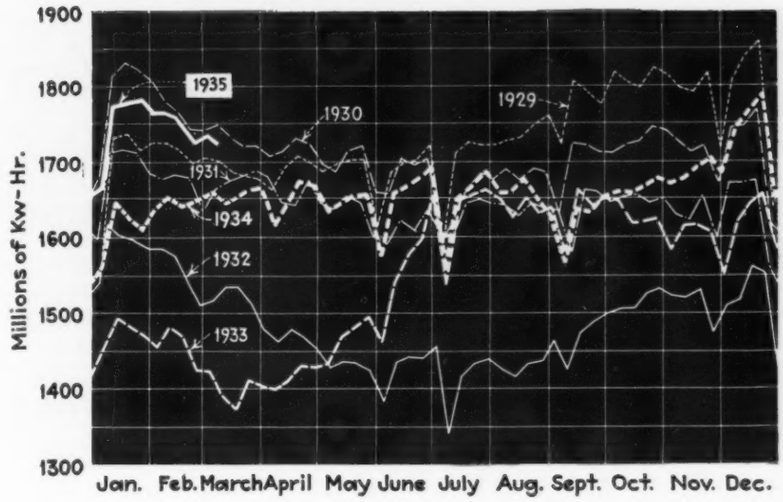
Oklahoma House has referred to committee a bill repealing the anti-utility merchandising law of 1931. A bill permitting municipalities to acquire utilities and pay for them with earnings from such plants is still pending.

Bills designed by P.W.A. progress

An amendment to the Constitution authorizing the state to engage in the power business will be submitted to the voters of Washington at the general election in 1936 as a result of the action of the Senate, which has passed the measure 34 to 11. It had passed the House last month (ELECTRICAL WORLD, March 2, page 48). This measure, together with several other utility bills, was included in the legislative program drawn up by Harold L. Ickes, Public Works Administrator, and recommended to Governor Martin.

Idaho Senate killed a joint resolution calling for the creation of power districts.

Output 24 per Cent Over 1933



Energy production in central electric light and power stations, as announced weekly by the Edison Electric Institute, is consistently surpassing that of all other years except 1930 and since early February it has been running only 1 per cent short of the records set in that year. Compared with 1934 there was a gain of 4.6 per cent in the week ended March 2 and 4.7 per cent in that of March 9, the figures being 1,734,338,000 and 1,724,131,000 kw.-hr., respectively.

At the beginning of the year an increase over 1929 was recorded. This lead has been maintained while the recovery from the lowest first half-year of the depression, in 1933, now stands at 24 per cent.

Maximum regional gains over 1934 are reported from the Rocky Mountain states, with the Pacific and Southern states next, while more moderate progress is indicated in the Eastern and Central industrial areas.

Weekly Output, Millions of Kw.-Hr.

1935		1934		1933	
Mar. 9	1,724	Mar. 10	1,647	Mar. 11	1,391
Mar. 2	1,734	Mar. 3	1,658	Mar. 4	1,423
Feb. 23	1,728	Feb. 24	1,646	Feb. 25	1,426
Feb. 16	1,761	Feb. 17	1,641	Feb. 18	1,470
Feb. 9	1,764	Feb. 10	1,652	Feb. 11	1,483
Feb. 2	1,763	Feb. 3	1,636	Feb. 4	1,455

Per Cent Change from Previous Year

Region	Week ended Mar. 9	Mar. 2	Feb. 23
New England	+ 2.3	+ 1.3	+ 3.3
Middle Atlantic	+ 2.5	+ 1.3	+ 2.7
Central Industrial	+ 4.9	+ 5.0	+ 5.8
West Central	+ 3.2	+ 3.9	+ 6.3
Southern States	+ 5.7	+ 7.1	+ 6.0
Rocky Mountain	+15.1	+11.4	+13.6
Pacific Coast	+ 6.0	+ 6.3	+ 1.6
United States	+ 4.7	+ 4.6	+ 5.0

First Profit Since 1930 Reported by Westinghouse

In its annual statement for the year ended December 31, 1934, released this week, the Westinghouse Electric & Manufacturing Company reports a net income earned of $189,562, compared with a net loss of $8,636,841 for the year 1933. These results are after provision for depreciation and other reserves. Sales billed for 1934 totaled $92,158,893, compared with $66,431,591 for 1933, representing an increase of 39 per cent.

Orders received totaled $106,473,226, compared with $72,473,117 in 1933, an increase of 47 per cent. Unfilled orders at the close of the year amounted to $34,085,921, compared with $26,954,044 at December 31, 1933. On December 31, 1934, current assets amounted to $80,328,712 and current liabilities to $6,122,180, a net working capital of $74,206,532 and a ratio of current assets to current liabilities of 13 to 1.

In the report, A. W. Robertson, chairman of the board, and F. A. Merrick, president, say in part: "Better business was reported by all principal divisions of the company and billings for the year were substantially above 1933. The total, however, still was only approximately 50 per cent of the average volume in the years preceding the depression. . . . Unless there is a marked change for the worse, the operations of the company for the year 1935 will show a substantial profit."

•

Strike Cripples El Paso

The twin cities of El Paso, Tex., and Juarez, Mexico, were plunged into darkness on February 28 when 150 employees of the El Paso Electric Company went on strike, pulling the master switches in the big Rio Grande power plant north of the city and in the Santa Fe Street emergency plant downtown. Labor spokesmen said the employees walked out for recognition of their union, higher pay and changed working conditions. For twelve hours business was paralyzed, but a truce was set and a board of arbitration appointed to settle the difficulties. A deadlock, however, resulted when the compromise proposed by the board was rejected.

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British Output Increases

Official returns just submitted to the British Electricity Commissioners show that 1,714,000,000 units of electricity were generated by authorized undertakers in the United Kingdom during the month of January, compared with the revised figure of 1,536,000,000 units in the corresponding month of 1934, representing an increase of 11.6 per cent.

•

Output 8 per Cent Over 1934

Starting the year with a gain of 8 per cent over the like month of 1934, public utility plants generated 8,058,000,000 kw.-hr., in January, according to the U. S. Geological Survey. This was slightly more than in January, 1929, and 4.5 per cent less than in 1930, when the maximum was recorded for January. The average daily production increased 2.5 per cent over December, whereas the normal increase is 0.5 per cent. Water power contributed 3,266,000,000 kw.-hr., or 42 per cent of the total, with an increase of 2.5 per cent in average daily output compared with December. The reports include plants for electric traction and others supplying energy for public use.

Regional gains in per cent, compared with corresponding months a year ago, were as follows:

Region	Nov.	Dec.	Jan.
New England	+ 2	+ 6	+10
Middle Atlantic	+ 2	+ 4	+ 7
East No. Central	+ 4	+ 5	+ 7
West No. Central	+12	+22	+21
South Atlantic	+ 7	+12	+10
East So. Central	+18	+27	+13
West So. Central	+ 7	+ 9	— 1
Mountain	+ 6	+10	+ 7
Pacific	+ 4	+ 6	+ 8
United States	+ 5	+ 8	+ 8

•

Loss Converted into Gain

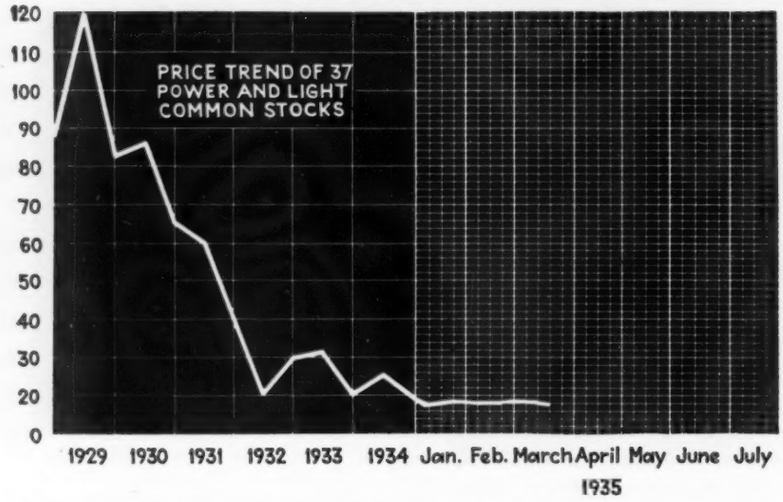
Wagner Electric Corporation reports for the year 1934 net income totaling $314,329, equal, after preferred dividends, to 60 cents a share on 391,388 common shares, contrasted with net loss of $66,349 in 1933.

New York Metal Prices

	Feb. 27, 1935 Cents per Pound	Mar. 13, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.55	3.55
Antimony	14.25	14.25
Nickel ingot	35.00	35.00
Zinc, spot	4.05	4.25
Tin Straits	47.75	46.85
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Utility Stocks Slightly Lower



Yielding slightly to governmental pressure, electric light and power stocks lost some ground during the past week. "Electrical World" index, 17.5; last week, 18.1.

Municipal Ownership Urged at Washington Meeting

J. D. Ross, superintendent of the municipal light and power system of Seattle, Wash., and author of a recent plan for acquisition of all electric properties of the Puget Sound Power & Light Company by the city of Seattle, told members of the Public Ownership League of America at their recent convention in Washington, D. C., that the federal power plant program covers only four or five inches of the yardstick that they are intended to provide. "The other 31 or 32 inches," he said, "are the price that the consumer must pay to have the current transmitted from the generating plant and distributed to his home." Mr. Ross advocated complete municipal ownership of all electric distributing systems in the country as the best means of completing the yardstick and viewed this as an inevitable consequence of existing conditions.

T. D. Bouchard, speaker of the Legislative Assembly of Quebec and secretary of the League of Municipalities of that province, told the story of the movement that is under way in Quebec to duplicate in that province what has already been achieved in Ontario.

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New York Utility Tax Yields $1,518,771

January installment of New York City's 3 per cent tax upon the earnings of public utilities brought the unexpectedly high yield of $1,518,771, according to an announcement made by City Collector William Reid, Jr. Returns still to be filed, it was said, may increase the total by another $50,000. On the basis of January payments the tax will yield considerably more than the $15,000,000 predicted when it was enacted into law by the city government last December.

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Sovietization Move Charged by Weadock

Bankers hear Edison Electric Institute's managing director attack efforts to ruin all basic industry — Predicts T.V.A. deficit this year

In an address made last week at the annual Eastern Regional Savings Conference of the Savings Division of the American Bankers Association in the Waldorf-Astoria Hotel, New York, Bernard F. Weadock, vice-president and managing director of the Edison Electric Institute, charged certain groups with forming an "unholy alliance" to sovietize basic industry of the United States, abolish private business and establish government ownership. He specifically named the Public Ownership League of America, the League for Industrial Democracy, the National Popular Government League, the People's Legislative Service and the Socialist Party.

"They have deliberately and maliciously told half-truths and have distorted facts so cleverly and so ingeniously," Mr. Weadock stated, "as to render difficult the pointing out of the falsehoods, upon which their campaigns have been builded."

On the question of the Tennessee Valley Authority "yardstick," Mr. Weadock predicted that the T.V.A. in its fiscal year ended June 30 would show total power revenues less than interest and depreciation on the $20,000,000 present book value of Muscle Shoals.

•

Pacific Gas & Electric Plans $45,000,000 Issue

Announcement was made this week that the Pacific Gas & Electric Company had registered with the Securities and Exchange Commission a new issue of 4 per cent bonds totaling $45,000,000 to retire $44,636,000 of 5½ per cent bonds due in 1952. Offering the bonds at par, the utility company will effect an estimated saving of $675,000 annually.

•

Sangamo Net Profit $197,644

Consolidated balance sheet of the Sangamo Electric Company of Springfield, Ill., and affiliated companies, recently issued, shows a net profit of $197,644 for 1934, compared to a loss of $63,654 for 1933.

Current Earnings Reports

Operating Companies

	1935	1934
Alabama Power (Year to Jan. 31)		
Gross earnings....	$15,458,466	$15,511,341
Net balance.....	524,060	898,853
Consumers Power (Year to Jan. 31)		
Gross earnings....	28,836,997	25,947,939
Net balance.....	3,027,472	2,821,073
Detroit Edison (Year ended Jan. 31)		
Gross earnings....	45,512,066	41,368,649
Net balance.....	5,474,670	6,358,560
Georgia Power (Year to Jan. 31)		
Gross earnings....	22,197,119	22,132,030
Net balance.....	1,015,204	2,001,213
Ohio Edison (Year to Jan. 31)		
Gross earnings....	15,363,713	14,404,913
Net balance.....	1,448,271	1,256,244
Kansas City Pwr. & Lt. (Year ended Dec. 31)	1934	1933
Gross earnings....	14,793,445	14,202,295
Net balance*.....	3,322,835	3,212,725
Southern Cal. Edison (Year ended Dec. 31)		
Gross earnings....	36,296,451	35,251,630
Net balance*.....	10,697,552	11,136,420

Holding Companies

	1935	1934
Commonwealth & Southern & subs. (Year ended Jan. 31)		
Gross earnings....	$115,692,294	$108,882,092
Net balance.....	1,299,289†	871,798†
Public Service Corp. of N. J. & subs. (Year ended Jan. 31)		
Gross earnings....	120,430,504	116,926,889
Net balance*.....	25,018,446	26,706,757
American Gas & Elec. & subs. (Year to Dec. 31)‡	1934	1933
Gross earnings....	67,726,106	63,348,424
Net balance.....	7,463,601	7,559,511
Columbia Gas & Elec. & subs. (Year ended Dec. 31)		
Gross earnings....	77,711,926	74,727,906
Net balance.....	2,829,382	5,940,349

*Available for all dividends. †Deficit. ‡Preliminary.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

Area Committees Plan Announced by N.E.M.A.

Another distinctly new activity for the National Electrical Manufacturers Association is the new plan for area committees approved at the last meeting of the board of governors. This new policy embraces the establishment of committees of members in geographic areas selected largely as marketing areas. The officers' committee has been delegated by the board of governors to set up the details of the operating plan for this program.

•

New Devices to Pierce Fog

Burning incandescent lamps overvoltage in special reflectors or lenses would increase the candle-power of fixed marine signal lamps a thousandfold and increase visibility in a given direction in fogs by as much as three times, in the opinion of Gjon Mili, engineer of the Westinghouse Lamp Company. Mr. Mili disclosed this possibility in a technical paper presented before a joint meeting of the American Physical and Optical Society of America held recently at Columbia University. "In a properly designed reflector or lens the same lamp burned overvoltage could produce as high as 500,000 cp. It would be visible three times farther than the 50-cp. source," Mr. Mili stated. The overvoltage operation of an incandescent lamp was explained as the application of more volts than necessary to produce ample light over the usual average life of 1,000 hours, such as operating a 115-volt lamp at 140 volts.

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Bondholders Organize for Protective Action

A bondholders' committee for the Arizona Edison Company first mortgage 3 per cent bonds, due January 1, 1948, and the first mortgage sinking fund 6 per cent bonds, series A, due October 1, 1945, has been organized. The committee stated that the company has been placed by the United States District Court of Arizona in the hands of a bankruptcy trustee for the purpose of reorganization and a plan for reorganization has been filed in that court in behalf of the holders of the junior securities of the corporation. The committee further stated that it does not consider the plan filed is suitable to the situation and said that immediate action is necessary.

•

Ford Energy Consumption Reaches 1929 Peak

Consumption of electric energy at the Rouge plant of the Ford Motor Company under its present production schedule has reached a peak which parallels electric consumption in 1929, previously the peak year since the company was founded. The Rouge plant is now using 61,000,000 kw.-hr. per month. The statement was issued at the company's home offices in Dearborn.

Mining Engineers Hear Federal Power Plan Hit

At the annual meeting of the American Institute of Mining and Metallurgical Engineers, held in New York recently, the Roosevelt Administration's hydro-electric power program was sharply criticised. The plan to supply consumers with cheap power generated by water will deal the coal mining industry a severe blow, according to Samuel S. Wyer, consulting engineer of Columbus, Ohio.

"Most of the people who are urging putting the United States into the power business are believers in an economic Santa Claus," Mr. Wyer said. "Today's nation-wide political interest in electric power comes from the failure of many electric companies to establish fair rates. There is no operating justification for any domestic rate over 5 cents a kilowatt-hour. There is likewise no economic justification for granting a lower rate for electric cooking than is granted for other domestic service . . . This unsound rate situation, which the companies could easily have corrected themselves, but which they permitted to continue and fester until it became a political sore, gave the demagogue his chance . . ." More than 150 papers were read.

•

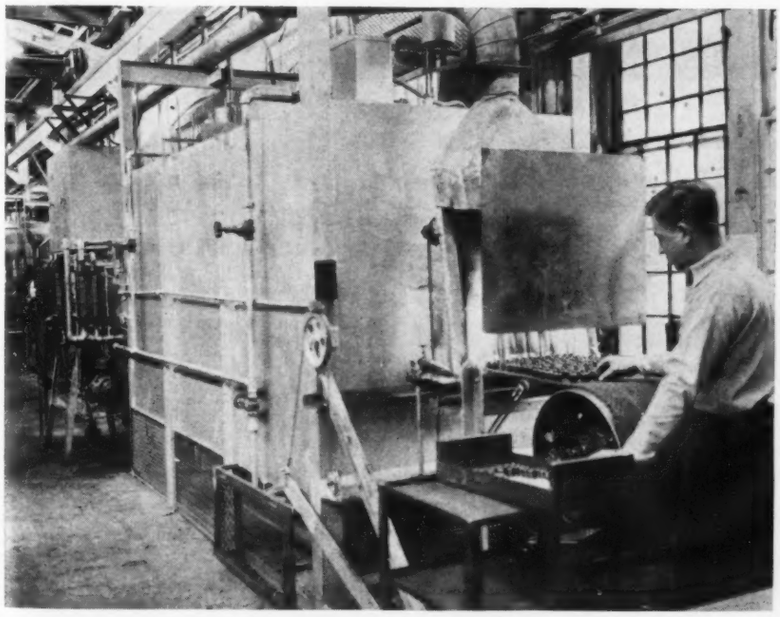
Great Britain Only 35 per Cent Electrified

Substantial as the year's electrical progress has been in the United Kingdom, all the indications point to still greater progress during 1935 and ensuing year. Reviewing the situation recently, J. M. Kennedy, member of the British Electricity Commission, stated that the number of electricity consumers was about 5,300,000, of whom about 4,200,000 were domestic consumers. As there are about 12,000,000 separate families in Britain the country appears, in spite of an accelerating advance, to have reached a saturation point in numbers of only 35 per cent.

Sir William Ray, executive chairman of the British Electrical Development Association, claims that the scope for further development is even more impressive than Commissioner Kennedy's figures suggest, when the margin between the actual and the possible demand in the case of existing consumers (who are only beginning the electrification of their homes) is taken into consideration.

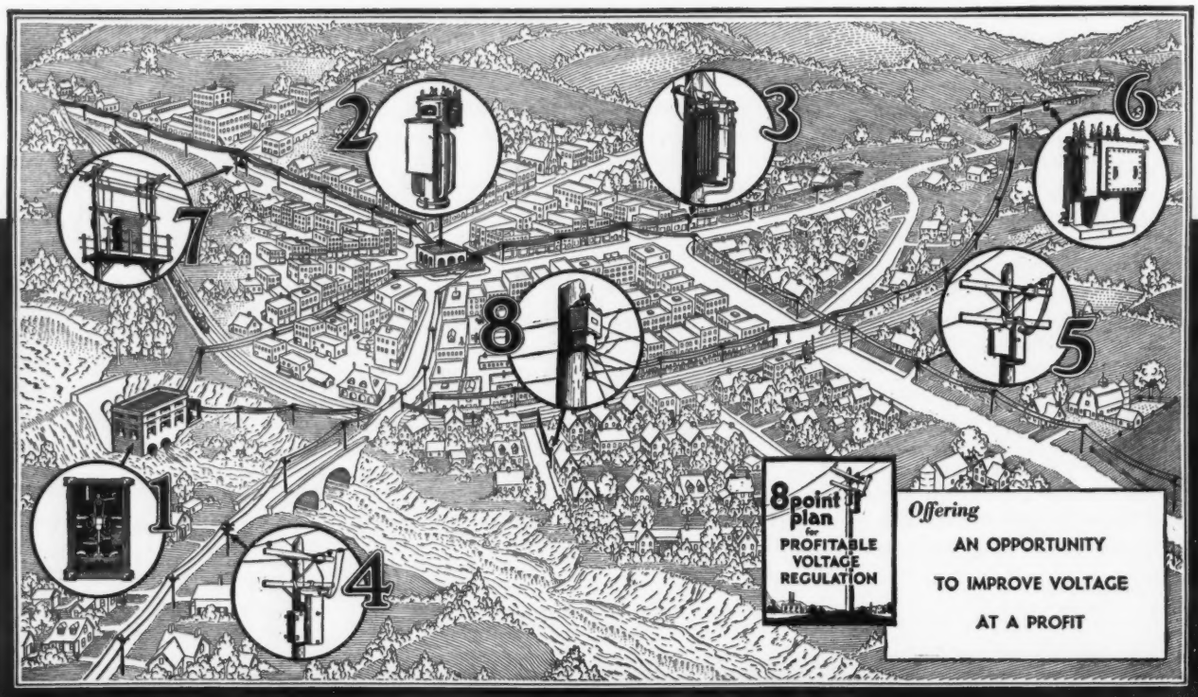
"As Mr. Kennedy pointed out," states Sir William, "the average number of units sold per domestic consumer per annum is 450, and the smallest household will require 1,500 units per annum for lighting, cooking, and ironing, and three or four times as much when space heating and water heating are carried out electrically."

G.E. MESH-BELT CONVEYOR-TYPE FURNACE



In the manufacture of G. E. refrigerating machines this new electric-furnace-brazing installation turns out steel assemblies of unique designs. They are brazed with copper in a controlled atmosphere and, as a result of the inexpensive methods employed in forming and fabricating them, are produced at low cost.

Announcing the
for Profitable



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3. New Branch-Feeder Induction Voltage Regulators for supplementing station-type regulators and holding voltage on heavily loaded single-phase branches (2400 or 4800 volts), or for regulating sections of very long three-phase feeders.

4. New Branch-Feeder Step Voltage Regulators for supplementing station-type regulators in holding the voltage on single-phase branches (2400, 4800, or 6900 volts) where load does not justify induction voltage regulators.

5. New Branch-Feeder Step Voltage Boosters for single-phase branch circuits of 2400, 4800, or 6900 volts where characteristics and load require a uniform boost in voltage during certain periods of the day.

6. Improved Step Voltage Regulators for higher-voltage circuits in suburban and rural service.

7. Series Capacitors for compensating for line reactance in primary distribution circuits rated 4000 volts and higher, to eliminate or reduce instantaneous voltage fluctuations which cause lamp flicker.

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350-110

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OPERATING PRACTICES

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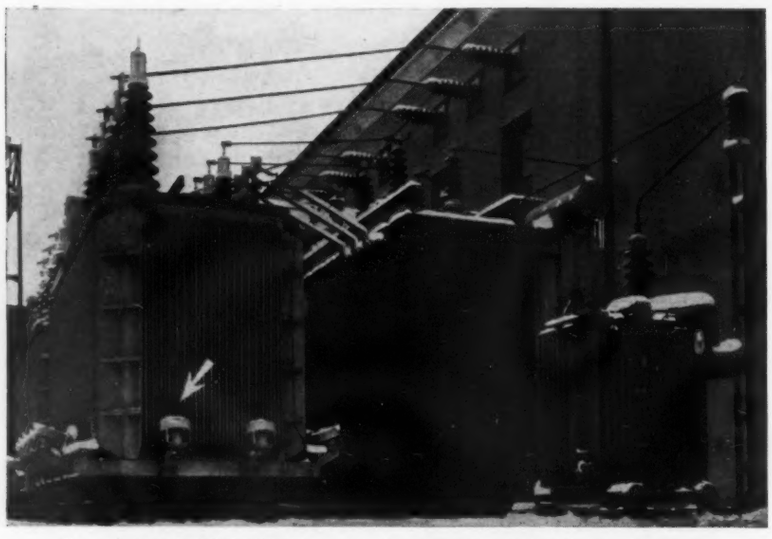
Tertiary Units Tie Three Systems

By RENE W. P. LEONHARDT
Berlin, Germany

To interconnect a 10-kv. pumped-storage generating station with 50-kv. and 100-kv. transmission systems in Germany the Thueringenwerk employs a three-winding transformer at Bleiloch, thus avoiding a series of transformations in exchanging power between the systems. Each of the three windings is designed to transform the full rating of the transformer —25,000 kva. By considering seasonal changes in ambient temperature, daily changes from hydro-generation to pumping storage with power from the interconnected systems and also the seasonal load variation, it was possible to avoid providing the transformer capacity which would have been necessary for continuous operation at full load.

Each of the two generators in the hydro plant is connected to its individual transformer. An adjustment of 10 per cent in the generator voltage coupled with ±6 per cent voltage adjustment on the 100-kv. windings allows for operating conditions on the 100-kv. system. To permit regulation of the 50-kv. transmission system independently of the 100-kv. network the 50-kv. winding of the transformer is provided with an on-load tap-changing device permitting ±8.7 per cent adjustment in eight steps.

Self-cooling of the transformers up to 55 per cent of full load and auxiliary cooling for higher loads was effected by using fin-type tanks and placing twelve propeller-type fans around the base of each tank which can be operated in two groups to blow air against the tank during the higher loads. This construction avoided using separate oil coolers or cooling coils.



Fan-cooled 10/50/100-kv. transformers for interchange between three systems

Note fin-type tanks, propeller-type fans around base and 10-kv. leads to cubicle on right housing terminals of cables from hydro generators.

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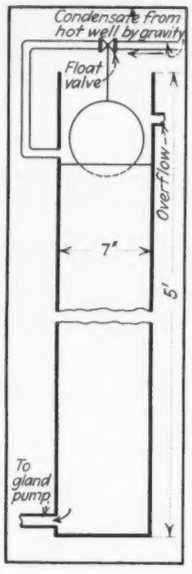
Storing Condensate for Turbine Glands

By C. E. CUSHING
Northern States Power Company,
Minot, N. D.

Neither city water nor boiler make-up gave satisfactory conditions in the sealing glands of the steam turbine of the Northern States Power Company at Minot, N. D. Both require extensive treatment. Consequently piping of condensate to the glands was considered, but a difficulty arose.



Condensate storage tank serves sealing glands of turbine

Condensate flows from the hot well pump discharge to the small storage tank, in which the water level is maintained by a float valve. The small pump for maintaining water pressure in the turbine glands is connected to the outlet at the bottom of the tank.

Exhaust steam from the power plant supplies a district heating system, from which the condensate is not returned. When the heating load is heavy there may be very little or no condensate in the hot well of the operating turbine. Clearly an automatic storage device of some kind was required. The solution of the problem took the form indicated by the accompanying sketch. The full tank is large enough to supply gland water for any period during which the hot well might be dry, or nearly so. Then, when condensate becomes available again, the tank refills.

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220-Kv. Cable and Oil Houses

Just recently returned from an observation of European practices, Donald Simmons, chief engineer General Cable Company, reports service studies with 220,000-volt cable in Paris and unusual joint-reservoir housings in London.

Twelve miles of 220-kv. cable purchased from four different manufacturers is being installed by the Union de l'Electricité, Paris, of which J. Fallou is electrical engineer. The in-

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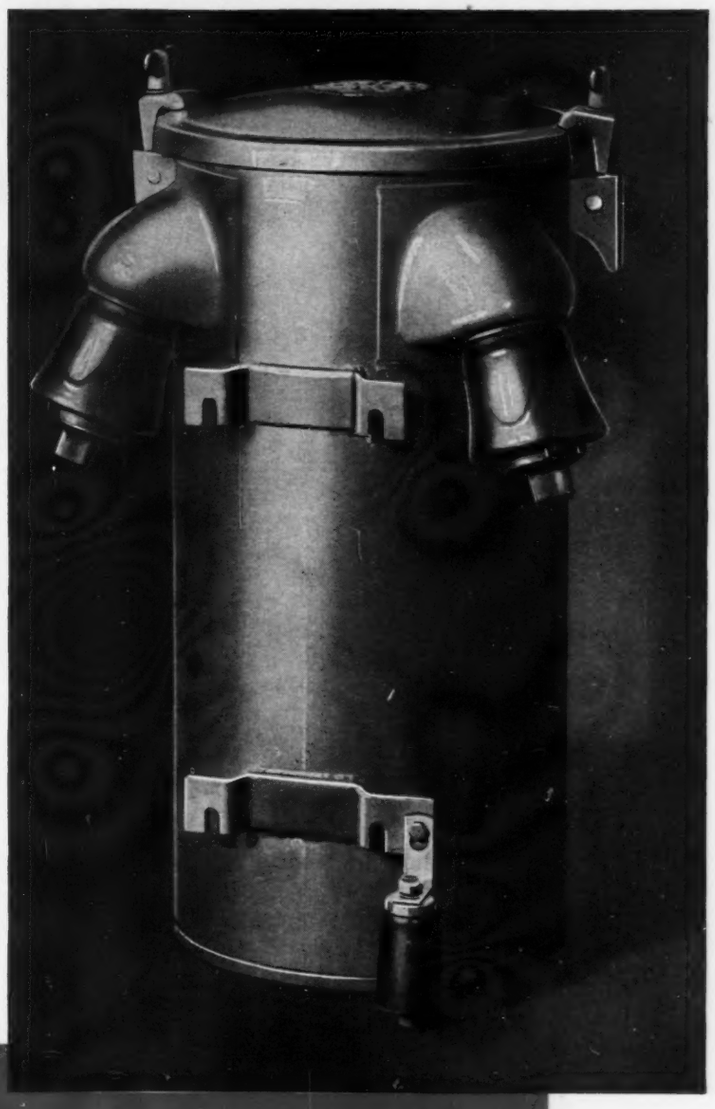

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GENERAL ELECTRIC

stallation will be finished by this summer and will be employed to study performances under service conditions. Artificial heating methods will be employed to stimulate expansion and contraction of the cable oil and sheaths. Except for adaptation to the higher voltage, the stop and straight-through joints are similar to those used on oil-filled, high-voltage cable in Cleveland and elsewhere. Some features are the terminal construction, the unusual manholes and the way the cable is laid.

Between Battersea and Wimbledon stations in London joint-reservoir housings are erected on back-property lots because of the difficulty of securing subsurface street space for adequate manholes. They are very attractive one- or two-story buildings, with stop joints on the first floor and reservoirs on the second.

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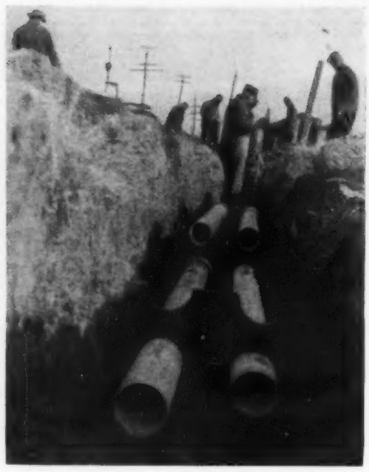
Asbestos-Concrete Ducts for Cables

By J. J. BURRI
Superintendent Transmission and Distribution, Staten Island Edison Company

Installation of a new form of concrete cable duct is obviating the necessity for a protecting concrete envelope in an underground transmission and distribution cable duct line being laid by the Staten Island Edison Company. The elimination of grade crossings by the Staten Island Rapid Transit Railroad Company necessitated the construction of 900 ft. of underground duct line to replace the one being razed to permit the railroad construction work. Four 5-in. ducts carrying 33-kv. transmission feeders and four 3½-in. ducts carrying 6,900- and 2,300-volt primary distribution cable are to make up the new duct line.

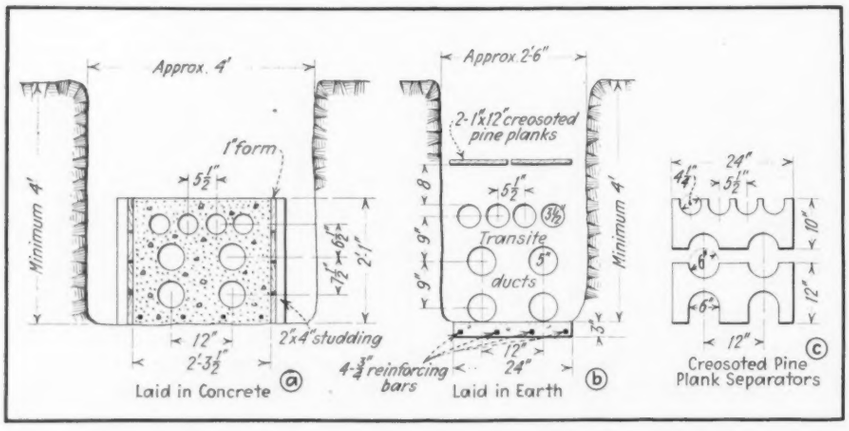


Unprotected concrete cable ducts supported by separators

High-strength pressed asbestos and concrete conduit construction was adopted because of the lower resulting installed cost. It was estimated, and experience to date seems to indicate, that a saving of 50 per cent in installed cost, exclusive of manholes and cables, will be effected by this type of construction. Elimination of the concrete envelope and the resulting reduction in the amount of excavation and backfill necessary, due to the absence of bulky concrete forms, accounts for a large part of the saving. The ease of installation of the ducts, permitting a gang of twelve unskilled workers to install an average of 50 trench feet per day, under favorable conditons, further accounts for the low installation cost.

Transite conduit was used, a recent development of Johns-Manville that is non-inflammable, corrosion, erosion and moisture-proof, has a high arcing resistance and is light in weight. It has a high thermal conductivity, resulting in rapid dissipation of heat from the cable, and its high arcing resistance precludes the transmission of burnouts to adjacent cable ducts.

The main precaution necessary in laying a duct line of this type is to insure careful and proper tamping of backfill around all ducts to provide support to the cable between separators and to prevent the occurrence of air pockets which might cut down the thermal conductivity sufficiently to cause hot-spots in the cable.



Elimination of concrete envelope cuts cost of duct installation

Elimination of forms and concrete work shown in (a), by the use of cement and asbestos pressed duct so reduced excavation width and material cost that the duct installation shown at (b) can be made at a 50% reduction in over-all duct expense. (c) Creosoted pine plank separators used to space the ducts in the trench and to hold them in place while backfill is being tamped in. The concrete pad shown in (b) is used only where earth fill is fresh or very soft; plank gives "pick" protection for ducts.

•

Dynamite Used to Set Poles

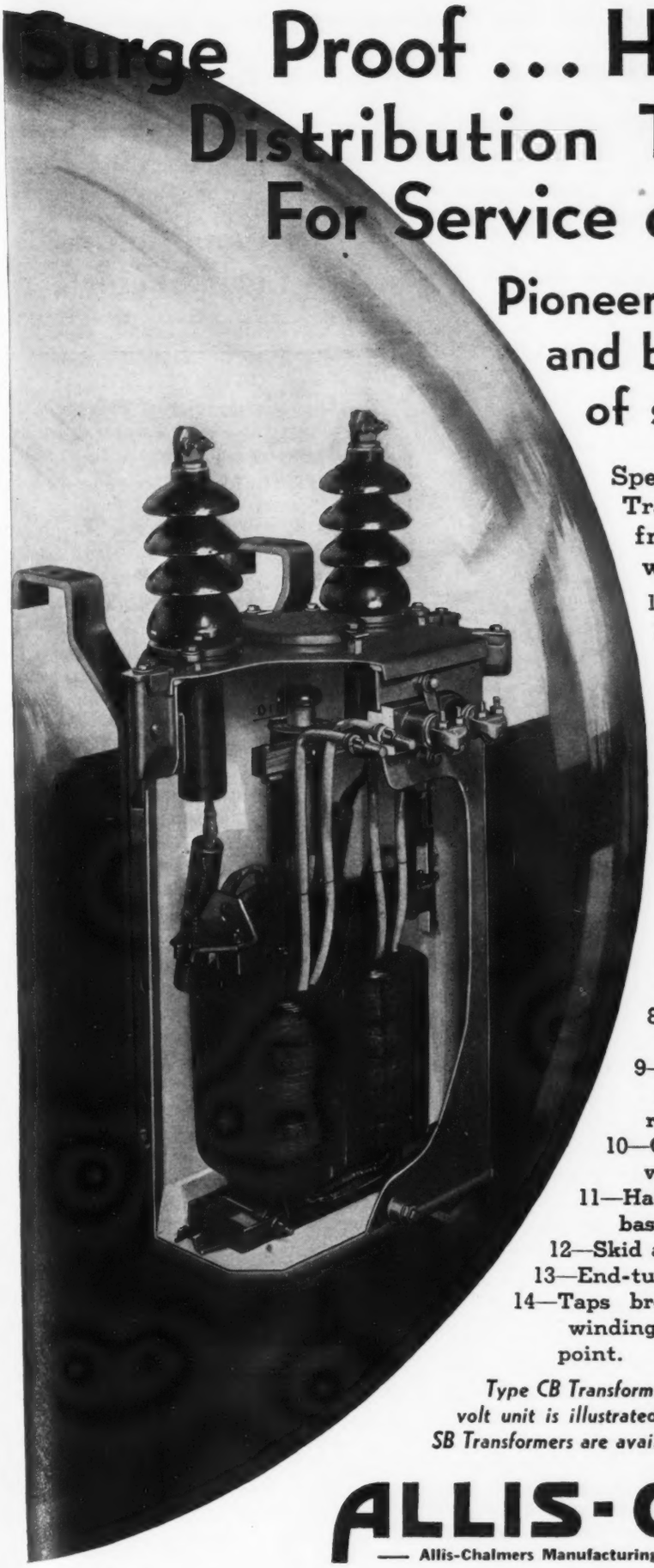
By FRED CLAYTON
Nashville, Tenn.

Where there is a large amount of water in sand, making it difficult to dig pole holes in the usual way, the writer has for years resorted to a headless barrel which is allowed to sink into the hole as fast as the hole is dug. But a method of utilizing dynamite for setting poles, under such conditions, has been found advantageous.

Use a short piece of 1½-in. iron pipe, flattened on one end and threaded on the other. Screw this loosely onto a longer pipe of the same size and drive the short piece down a little deeper than the hole is to be made. While the long piece is still screwed to the short one, about one-half stick of dynamite is lowered into the short piece of pipe by means of ignition wires. The long pipe is then unscrewed and raised, leaving the ignition wires in place. With the latter protected by a board against side of hole, the pole is set up over the small driven hole and held by guy ropes in an upright position. Keeping all the men at a safe distance, the dynamite is detonated. The pole will jump up a foot or more as the sand is discharged, but will drop back into the hole before it fills up. The pole can then be straightened and the earth tamped.

Surge Proof ... High Voltage Distribution Transformers For Service on Rural Lines

Pioneered by Allis-Chalmers and backed by four years of satisfactory service



Specify Type "CB", Allis-Chalmers Transformers for continuous, trouble-free service. Here are 14 reasons why they are better:—

1—Completely surge-proof.
2—High voltage bushings coordinated, quadruple petticoat type, cover mounted.
3—Totally enclosed, sludge-proof tap changer; easily accessible through hand-hole in cover.
4—Bushing shanks and all internal electrical connections immersed in oil.
5—All leads encased in insulating tubing.
6—All terminals provided with non-corrodible solderless connectors.
7—Coordinated low voltage gang bushing.
8—All bushings easily demountable without removing cover.
9—Transformer of oil-tight construction and shipped completely filled with oil, ready for service.
10—Combination oil drain and sampling valve of non-corrodible material.
11—Hangers not extending below transformer base.
12—Skid angles underneath base.
13—End-turns super-insulated.
14—Taps brought out from the center of the windings insure safety against surges at this point.

Type CB Transformers, of which a 5 kva, 6900/11950Y—115/230 volt unit is illustrated, are available for 6900 volts and above. Type SB Transformers are available for the lower voltages.

ALLIS-CHALMERS

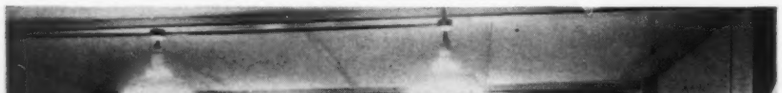
— Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin, U.S.A. —

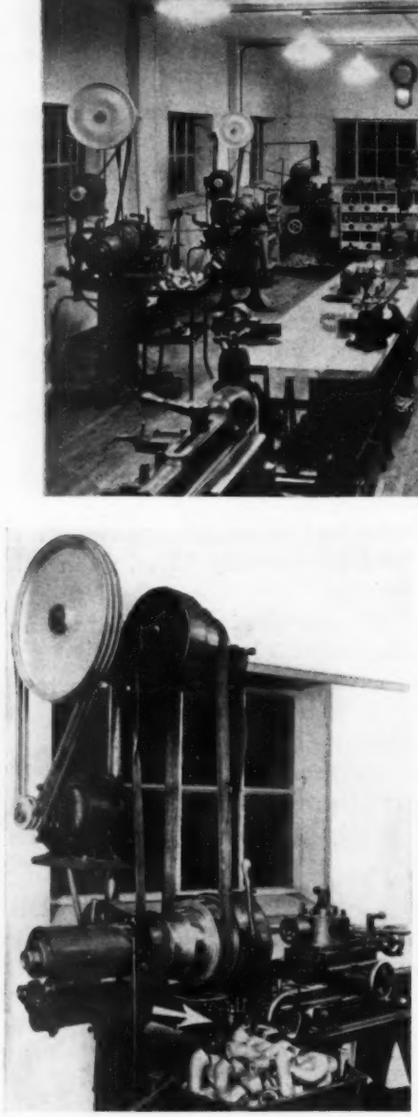
Remodeled Old Group Drive

By J. D. JOHNSON
Industrial Engineer
Rochester Gas & Electric Company

Individual drive was substituted recently for the old line shaft drive by the Nunn Brass Works, Rochester, N. Y. In doing so, however, it was desired to utilize the old cone pulleys for the major speed changes. Briefly, the conversion involved substitution of the support shown for the old pulley-shaft hangers, sawing off the line shaft on each side of the cone pulley, attaching the triple-groove V-belt pulley and mounting the motor on the same column that supports the overhead cone pulley. The control for the motor is mounted convenient to the operator, as indicated by arrow.

Seven lathes are similarly equipped.





A group of remodeled drives and details of one

These units, a shaper and a drill press, were formerly operated by line shaft and group drive rated at 7½ hp., single phase. The friction loss of this old drive was 2.5 kw., whether none or any of the machines were running, and on numerous occasions only one machine could be operated at a time. With the three-phase individual drive the friction loss is limited to the single unit operating (0.4 to 0.8 kw.). Furthermore, during idling or low-load periods the old drive drew wattless power as high as 5 kva., whereas now it seldom goes above 1.5 kva. Obstructions to light on the work have been largely removed and greater flexibility of operation has been obtained.

Air Conditioning in Cigar Factories

By duplicating Cuban temperature and humidity in its Trenton, N. J., factory, Henry Clay & Bock & Co., Ltd., manufacturer of high-grade Havana cigars, has been able to produce cigars equivalent in quality to those imported from Cuba, and by so doing has been able to sell them at practically half the price, as the high duty (50 per cent of selling price) is eliminated. As a result it has recaptured a market which was seriously depleted by the depression.

Proper humidity, temperature and air movement are necessary to cure or maintain the condition of the tobacco while being rolled, prevent its becoming brittle and to facilitate rolling. In the Trenton plant different combinations of humidity and temperature are employed in different departments, ranging from 70 to 80 deg. and from 50 per cent humidity to complete saturation. Air circulation is maintained at a low velocity because higher values cause operating or processing difficulties. Cuban climatic conditions are manufactured in this Trenton plant, where the night load is chiefly air conditioning and the night consumption about 40 per cent of the total daily consumption.

In the Philadelphia plant of the American Tobacco Company gross savings from air conditioning—reduction in lost time, labor turnover, rejects and increased production—have amounted to nearly $30,000 a year, or more than $23,000 over the combined fixed and operating charges on the air-conditioning equipment added. Lost time has been reduced from 1,875 girl-days to 187.5 girl-days. Labor turnover was reduced by 100 girls during the summer months, saving $50 per girl to train them. More comfortable working conditions increased the efficiency of workers, so that rejects were reduced from 3 or 4 per cent to 0.5 or 1 per cent. With complete air conditioning, production, which formerly dropped in summer to 3,600 cigars

per machine-day, due to humidity and temperature, is now maintained at full capacity or 4,000 cigars per machine-day.

•

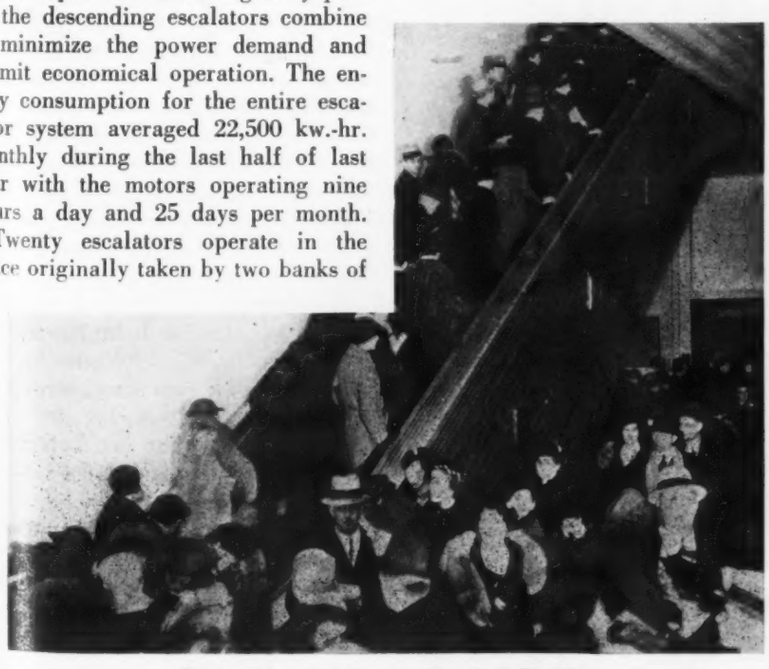
Capacitors Aid Moving Stairways

By HOWARD D. CARPENTER
Chicago, Ill.

With people standing on every step of an ascending escalator there is a continuous heavy burden on the driving motor. No momentum effect, no counter-balancing gravity pull helps the motor out as in the case of an elevator. The motor driving a heavily loaded descending escalator has very little to do. It would seem the obvious thing to put large motors on "up" escalators and small motors on the "down". However, it was decided that the twenty escalators, installed several months ago in the Marshall Field store in Chicago, should be reversible so traffic could be expedited according to its predominating direction at any time. As any motor may be very lightly loaded for hours, static condensers were installed to compensate for light-load conditions.

Each of the escalators is driven by a three-phase, 220-volt, 20-hp. induction motor which has an average demand of 5 kw., including travel in both directions. Two 50-kv. capacitors are connected with the two incoming circuits, each feeding a group of ten escalator motors. The corrective action of the capacitors and the gravity pull on the descending escalators combine to minimize the power demand and permit economical operation. The energy consumption for the entire escalator system averaged 22,500 kw.-hr. monthly during the last half of last year with the motors operating nine hours a day and 25 days per month.

Twenty escalators operate in the space originally taken by two banks of five elevators. There are two escalators per floor, one going up and one going down, from the basement to the ninth floor. The "up" units have carried more than 10,000 passengers per hour from the first floor, which is a load that would require about 30 elevators to handle. This is accomplished despite the fact that the running speed of the escalators is only 90 ft. per minute, compared with 350 ft. per minute maximum for the neighboring elevators. Allowing for elevator stops and for transfers from one escalator to another, the corresponding passenger distances and speeds from the first to the ninth floor are: By elevator, 135 ft. in 1½ minutes; by escalator, 270 ft. in four minutes.



Reversible escalators in Marshall Field's

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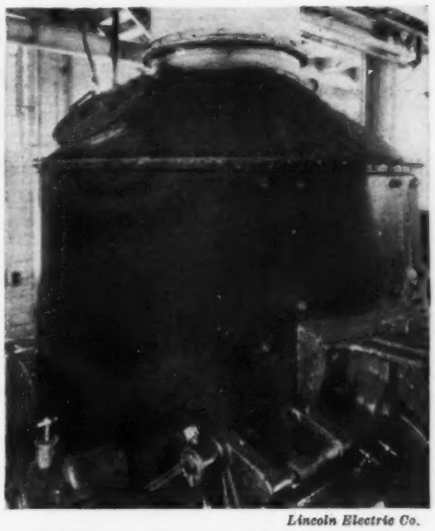
Coal Mill Costs Reduced by Welding

Because coaldust is a pretty good abrasive, maintenance is an important cost item in the operation of coal-pulverizing mills. To repair the ravages of dust erosion electric arc welding is peculiarly fitted, because with it, controlled deposition of selected metals on worn or scored surfaces is very easy. The surfaces are then machined down to original dimensions and the job is done. A striking instance in this connection comes from the plant of a Great Lakes power company, where reported savings of $3,000 annually are being made by using arc welding in rehabilitating roll type pulverizing mills, the shafts of which had become worn by coaldust getting into the bearings. Shaft replacements would cost about $60 each. By building up the worn shafts with metal deposited by arc welding and then turning them down replacements were avoided and the cost was less than $20 for each shaft.



Lincoln Electric Co.

Welding casing on pulverizing mill

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Eliminates Weak Link With Electricity

As small a part of a machine as tappets are, the degree of usefulness of the machine may be largely dependent on them. One manufacturer who recognized this fact changed from making them of cupola iron to electric-furnace iron, thereby increasing the tensile strength 28 per cent, reducing failures from repeated impacts greatly, cutting rejects from 18 to 4.5 per cent. The tensile strength of the electric-furnace iron is 41,000 lb. per square inch. With the old iron, failures with 900 impacts per minute were 33 per cent and with 1,200 blows 100 per cent. With the electric iron the failures under these duties have been reduced to zero. The charge from which the electric iron is made is 20 per cent bessemer pig, 72 steel, 8 scrap.

The Detroit Electric Furnace Company, which reports this manufacturer's experience, attributes the improved performance to superheating with close control of the heating period and temperature and better control of analysis and thorough mixing in the electric furnace.

Models Aid Field Construction

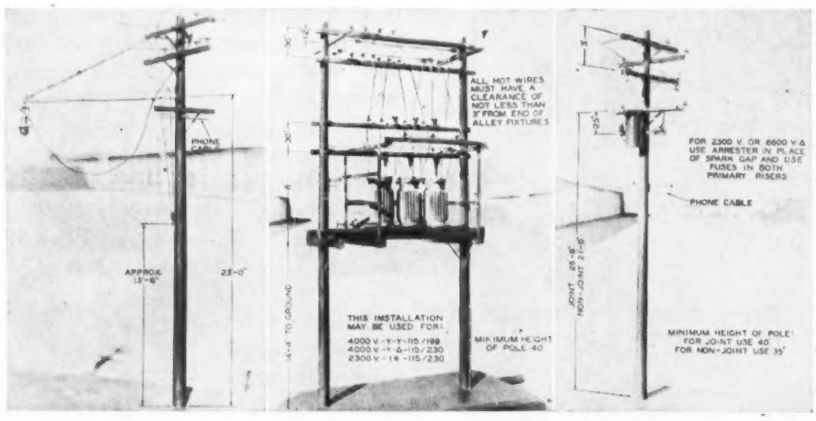
By R. A. HAMMACK
Overhead Standards Engineer
Public Service Company of Colorado

Model distribution structures, developed originally for the purpose of discussion of construction standards by the engineers and line foremen, have enabled a new type of field construction standard. All models were carefully made to scale, so that clearances and climbing and working spaces might be readily and accurately measured. Much has been done in this way to improve and make safer working conditions. Likewise, various economies in design have been worked out. Through class discussions of the models, weaknesses in present standards were brought to light, and new methods and designs were considered. The models proved a very great aid in creating and holding interest in the meetings and in promoting a comprehensive discussion.

The first models were made to a scale of one inch to the foot. Insulators, lightning arresters and other such items were turned from brass. Later it was found more expedient to build on a scale of two inches to the foot, so that these items might be turned from wood and that standard bolt sizes could be used. All braces, brackets and other hardware were of brass or steel and coated with aluminum paint. All items representing porcelain were painted glossy brown, and the poles, crossarms and other timbers were stained to a more natural aged color.

Having used the models to such good advantage in group discussions, it was decided that pictures of them would be more easily read and understood in the field than would the usual detail drawings. With this in mind, photographs were taken, governing dimensions, title, etc., put on, and the whole copied. Photostats were then made from the copied negative and it is reprints of these that are shown herewith.

While to date standards of this type have been used on a very limited basis only, they have met with enthusiastic approval by the construction department. Only one view of each installation has been included here, while two are required in the field for the more complex installations. Wiring diagrams accompany such picture standards when required. Dimensions of timbers and other details are not shown, as these are embodied in a material list which accompanies each order.


PHONE CABLE
APPROX. 13'-6"
25'-0"
ALL HOT WIRES MUST HAVE A CLEARANCE OF NOT LESS THAN 3" FROM END OF ALLEY FIXTURES
THIS INSTALLATION MAY BE USED FOR:
4000 V.-Y-Y-115/199
4000 V.-Y-Δ-115/230
2300 V.-1Φ-115/230
MINIMUM HEIGHT OF POLE 40
FOR 2300 V. OR 6600 V. Δ USE ARRESTER IN PLACE OF SPARK GAP AND USE FUSES IN BOTH PRIMARY RISERS
PHONE CABLE
JOINT 25'-6" NON-JOINT 21'-0"
MINIMUM HEIGHT OF POLE: FOR JOINT USE 40' FOR NON-JOINT USE 35'

Photographs of model distribution structures are part of overhead standards used by construction crews of Public Service Company of Colorado

(a) Street light mast arm—idler pulley method. (b) Transformer crib for joint alley construction—three single-phase 37½ to three single-phase 100 kva. inclusive. (c) Transformer installation, 1.5 to 25 kva. inclusive—4,000 volt Y, 2,300 or 6,600 volt delta, 115/230-volt systems.

Lightning Flattens Service Wires

By D. D. CLARKE
Electrical Engineer
Kansas City Power & Light Company,
Kansas City, Mo.

Leaping from the overhanging branch of a large walnut tree, a lightning discharge struck the service wires of a cottage near Kansas City one day last summer. The bolt divided into one part that entered the house and another that ran back along the span to the service pole. The curious condition of stripped insulation and deformed copper of the service conductors (illustration on page 58) suggests a method of finding the magnitude of the lightning stroke. Lightning current threw the wires together and the kinetic energy was absorbed in the collision. To obtain the amount of energy absorbed in the collision, pieces of No. 8 triple-braid, weatherproof wire were compressed in a testing machine. Solving the data thus obtained for the velocity of impact, it was found that each wire was traveling 413 ft. per second, or the mutual velocity was 826 ft. per second.

When this velocity energy was solved in terms of i^2t for normal service conductor spacings the resulting equivalent temperature rise would have just about melted the wire. But the wire had not been excessively hot; the traces of weatherproof saturant remaining on the copper appeared smooth and glossy as though the saturant had been moderately heated and then cooled quickly.

As observations of local thunderstorms indicate that lightning strokes are often multiple in character, two or more successive impulses may have ocurred, the first throwing the wires together and the last just before the wires collided. If the distance between the wires for the average acceleration of several impulses was not greater than about 1½ in., the resulting temperature rise would check with the appearance of the wire. To get an idea of the magnitude of the lightning discharge it is interesting to examine the

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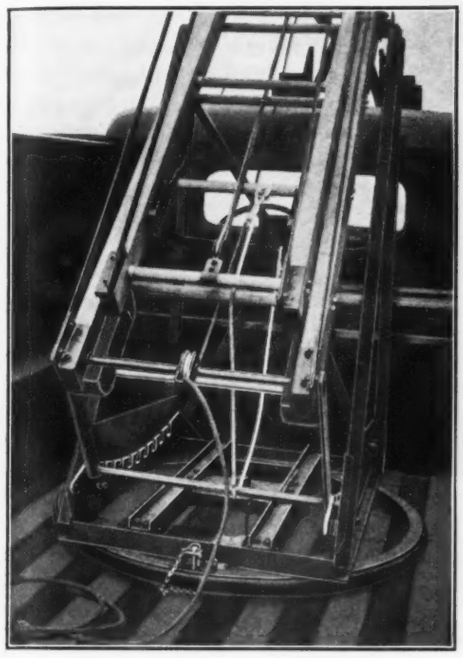

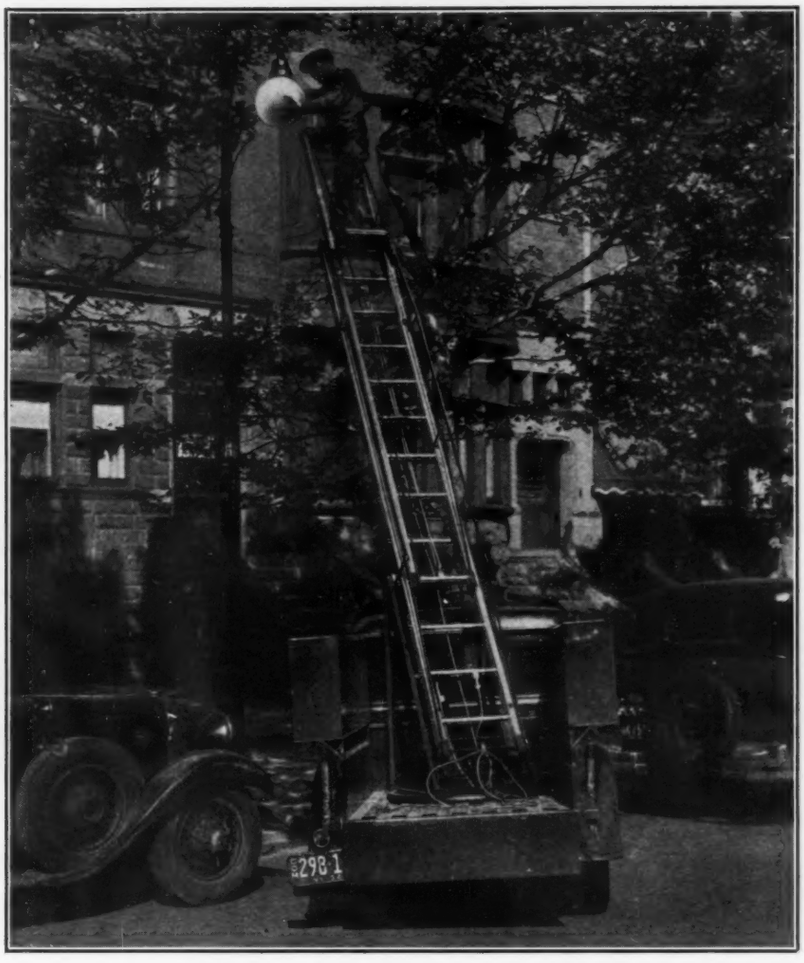

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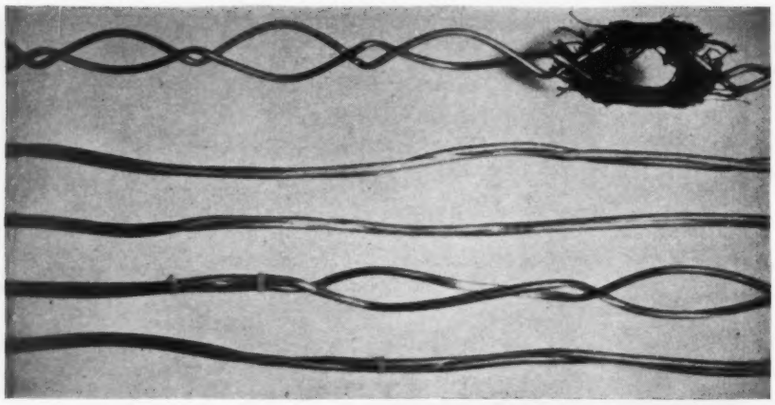
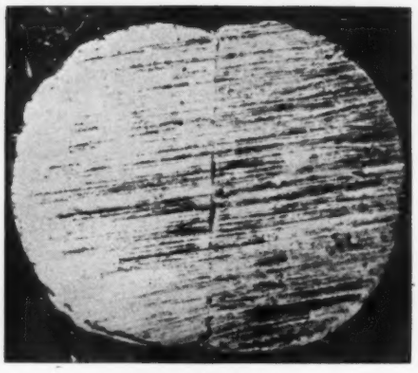


The wires slapped together
On the portion of the service drop, for most of the 90-ft. length from the stroke point to the pole at the road, the two No. 8 wires hit together, stripping off the insulation and burying into each other so as to appear at a glance as one larger bare wire.

resulting crest amperes with wave forms conforming to the recommended A.I.E.E. standard impulse test waves, 1x5, 1x10 and 1½x40 microseconds, using for convenience an assumed straight line front and straight line tail. For these conditions the lightning crest current in the two wires of the portion of the service drop between the tree and the pole is of an order ranging from 200,000 to 1,500,000 amp.



They hit hard
Here is a photomicrograph of an actual cross-section of the two No. 8 wires in the service span. The weatherproof coatings were probably literally exploded off the two wires as they came together.

Fan Blade Armatures for Speed Indicator

By M. D. STAHL
The Hoover Company,
North Canton, Ohio

Accurately measuring the speed of some rotating element is not always a simple matter when the device is located within a housing which must not be mutilated in any way. Such a problem was solved at the engineering laboratories of the Hoover electric cleaner plant in the case of an inclosed fan by using its blades in the manner of the teeth of an eddy or induction generator. Readings are available at some distance from the apparatus.

A U-shaped laminated iron core, ⅜-in. square, with two fine windings is placed with the core gap adjacent to the fan chamber. With d.c. magnetization of the core in one winding, the variations in the magnetic field caused by movement of the metal fan blades past the gap induce a varying voltage in the other winding. Frequency of the fluctuations is directly proportional to the number of flux variations per second. The small induced voltages are amplified by tubes with a single tuned circuit and output meter. The meter indicates a sharply tuned resonant condition when the tuned circuit is adjusted to a frequency corresponding to the product of the fan speed in r.p.s. by the number of blades.

This pick-up device operates on the eddy current principle and does not require that the fan blades be of magnetic material. The shielding effect of the fan chamber is readily overcome by a higher gain in the amplifier. Due allowance must be made for varying magnetic fields emanating from the driving motor. Accuracy of measurement depends almost entirely on the decrement and precision of calibration of the tuned circuit. A rough measurement of speed by some other means is desirable so as to make certain whether the fundamental or some particular harmonic is being used in tuning.

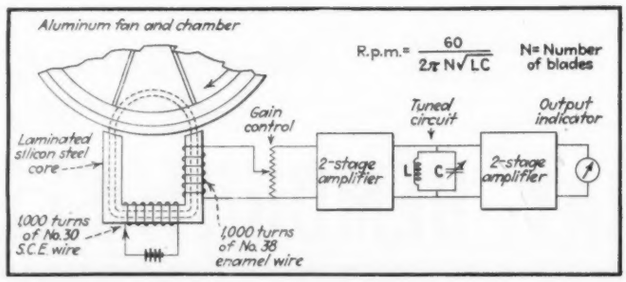
Light-Heat Filters Cut Heat Load

Determination of the economic balance between the cost of "calorific filter" glass, to intercept and confine to the upper strata of the room the heat energy radiation in high-intensity light, and equipment to carry away this heat due to unshielded lights, mechanically is an important air-conditioning problem, according to J. W. Mersfelder of the Frigidaire Corporation in a New York section Illuminating Engineering Society lecture.

Heat loads arise from walls, floors, ceilings, occupants of the rooms, lights, fans, motors and infiltration of air from the outside.

Results of an analysis to determine the more economic installation showed the following facts: The heat load of a certain installation before filter glass was adopted was 40,095 B.t.u. per hour. To get rid of this amount of heat by air conditioning would require a refrigerating effect of 3.34 tons per hour and the circulation of 1,700 cu.ft. per minute of air to lead away the sensible heat. After the "calorific filter" glass had been installed the heat load was reduced to 25,478 B.tu. per hour, a refrigeration effect of 2.12 tons per hour would be required and the circulation of 900 cu.ft. per minute of air to dissipate the sensible heat, it was stated.

The benefits derived from the use of the filter glass as shown by this case can be listed as follows: (1) Saving in refrigeration tonnage; (2) smaller fans and blowers; (3) lower operating costs; (4) smaller duct work; (5) lower cost of filters, grills, etc.; (6) less exposure of the occupants to infra-red radiation; (7) less draft in the room due to forced ventilation.



Remote indications of fan speed obtained magnetically

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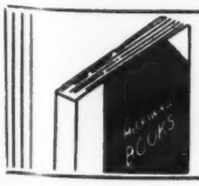

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BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

Boston Low-Price Range Sale Extended

So marked a popular response has been received to the Boston Edison electric range campaign begun last November that it was extended up to March 1. Up to January 15, 527 ranges had been sold by the company in territory largely supplied with gas. The basis of the campaign is the offer of a special range at $69.50 net installed, including a $10 allowance for a turn-in range. The terms also offer free delivery and wiring and installments as low as $4 a month for nineteen months. Without the trade-in a minimum down payment of $5 was established, with a slight upward revision of the final payment.

The campaign has had the advantage of thoroughly co-ordinated effort, including detailed training of employees, the use of sales quotas, cash premiums for outstanding salesmen in the city and suburban areas, awards for successful leads, window displays in the 31 company stores and electric cooking demonstrations by the company's staff. Nine weekly broadcasts at favorable hours are given from the Edison radio station WEEI. An important feature has been the enlargement of the specification staff so that wiring bids from contractors may be expedited.

Usually installations are in service within a week from the date of the customer's order. A base cooking cost of 1 cent per meal per person is used in quoting operating expenses with the electric range.

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Air Conditioning Gains in Georgia

Georgia Power Company added new load in air-conditioning equipment during 1934 aggregating about 440 hp. This will bring new consumption estimated at 540,000 kw.-hr. and an annual revenue of about $9,000. The installations were in the following classifications:

Type of Establishments	1934 No. Installations	1934 Hp.
Offices	17	60½
Restaurants	10	241
Hotels	4	3
Residences	9	15¾
Dep't stores	1	17
Hospitals	1	1½
Beauty parlors	1	12
Clothing stores	2	51
Barber shops	1	5
Laboratories	1	10
Undertaking parlors	1	3
Railroad cars	..	22
Total	46	441¾

Above installations are those made in the city of Atlanta only.

T.V.A. Requires Load for Rural Lines

Rigid requirements for rural extension which private utilities have difficulty in getting a commission to ratify have been promulgated by T.V.A. No extensions apparently are to be made until all prospective customers have wired their homes and bought enough appliances to bring their combined consumption up to an assured 662 kw.-hr. per month per mile. On a four-customer-per-mile basis this means 1,820 kw.-hr. per year for each of them. The Florence, Ala., *Times* on January 3 published the following letter from T.V.A. Division Engineer F. F. Beauchamp to Ralph M. Saliba, secretary of the Colbert County Chamber of Commerce:

GENTLEMEN: In compliance with your request regarding requirements by the Tennessee Valley Authority for the extension of rural lines in Colbert County, we are pleased to advise as follows:

The Tennessee Valley Authority will extend rural lines where such extensions can be supplied from existing lines, or lines now under construction, if the present number of kilowatt-hours sold per mile of line is not less than 662 per month, on either or both, the standard T.V.A. commercial or residential schedules of rates.

For estimating purposes ordinary lights should be figured at 30 kw.-hr. per month and electric ranges should be figured at 150 kw.-hr per month; an electric refrigera-

Price appeal featured to stimulate range sales at Boston

Tennessee Electric Power Company announced its 1935 line of electric refrigerators with much display and publicity in stores, windows, newspapers and direct mail advertising. One unique stunt attracted much attention and made much talk in Chattanooga. Fourteen new model Frigidaires were mounted on a trolley flatcar, which was decorated in brilliant spring colors and paraded over all the street railway lines of the city for a period of two days. Window displays featured the slogan—"Your next auto will be a streamline model. Your next radio will be a short-wave set. Your next refrigerator will be electric."

tor should be figured at 50 kw.-hr. per month and electric water pump should be figured at 50 kw.-hr. per month and an electric water heater at 200 kw.-hr. per month.

In making a survey for a rural line extension the following procedure is suggested:

"First, determine the actual length of the line in miles, or fractions thereof, necessary to serve the road or territory in question. This length should be measured from the nearest existing rural line of the Tennessee Valley Authority to the last customer to be served. To this length should be added all customers' tap lines from the main line in excess of 200 ft. from the main line. This last figure will give the actual length of the project.

"Second, the customers living along the line should then be contacted and these customers should make a binding valid contract with some reputable electric wiring contractor for house wiring, and also make a valid contract with appliance dealers for the purchase of ranges, refrigerators, water pumps and other appliances.

"If the estimated monthly consumption, figured as outlined above, equals an average of 662 kw.-hr. per month, the Tennessee Valley Authority will then advise the prospective customers, or the committee representing them, to complete their purchase contracts for house wiring and appliance purchases. The line will then be built when each and every one of these customers *have actually wired their premises and purchased the equipment they have contracted to buy.*"

"You may be confronted with the statement that the Tennessee Valley Authority has constructed some lines in Colbert County on which the above requirements were not met. Our only explanation of this fact is that those lines were originally started with the Civil Works Administration and the Tennessee Valley Authority is completing them in the hopes that they will be self-sustaining. You can readily appreciate the fact that the Tennessee Valley Authority's only requirement in the extension of rural lines is that they must be self-sustaining. You can also see, by examining the above policy, that it may be possible for a relatively few number of customers to secure the extension of a rural line by becoming heavy users of electricity."

One Utility Approach to New Business

"How are you increasing business?" One prominent manager of industrial sales who prefers to remain unidentified replies:

"*New Business*—All isolated plants (total and part served) located within the territory of our company have been carefully rechecked and previous studies gone over to determine what effect increased prices brought about by the NRA might have on their total operating cost. Following this recheck, the prospect is immediately contacted and presented with an up-to-date power cost comparison. Each isolated plant is assigned to a particular division salesman, whose duty it is to call on the prospect at regular intervals and check on all problems dealing with the customer's operations. He is continuously on the lookout for any change in conditions which may justify the prospect in purchasing all or part of his power requirements.

"In order to bring into the territory new industries which will increase the power company's load, not only from the standpoint of the power consumed by the industry itself, but also through residential service which the employees will require, we have established a 'New Industry Section' in the power-sales department. This department is not only on the lookout for industries seeking new locations but is also on the lookout for new ideas, new methods and new products which may materially assist our existing industries. They are also on the lookout for new outlets for the sale of products which our customers manufacture.

"*Increasing Usage*—We have found, during the past several years, that any additional business to be received from existing customers must come from the smaller applications. We have, therefore, laid particular stress on the smaller heating and other load-building appliances, tieing in with the program set up by equipment manufacturers. Sample kits have been furnished the salesmen so that the prospects can be shown equipment and demonstrations given, when the call is made. Particular attention is also given to modern, efficient, industrial lighting, which is very often the opening wedge for modernization of the entire plant. Air conditioning is stressed particularly in those plants where female help is employed, such as shirt, dress and clothing factories, and where processes are improved, such as textile mills, printing plants, etc.

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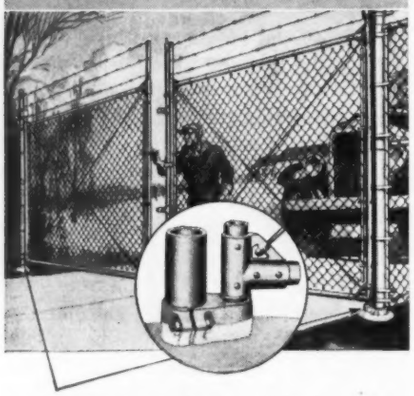
Power Sales Up in Alabama

Power sales of the Alabama Power Company for the first nine months of 1934 have shown a substantial increase over the same period of the last two years, being almost double the volume for the preceding years. A total of 11,972 kw. of power load has been signed, which is estimated to produce an annual revenue of $262,651. It is expected that these new power loads will require 24,226,000 kw.-hr. per year.

Of this total, 1,572 kw. represents business secured by electrification of load which has heretofore been driven by other forms of power. A total of 24 plants have abandoned operations of private power plants in favor of purchased power.

One of the largest blocks of power sold during this period is the contract for 2,500 kw. signed with the Kilby Car & Foundry Company of Anniston, Ala., for the operation of a new electric furnace to be used in the production of steel billets from scrap steel. It is estimated that this furnace will require 7,000,000 kw.-hr.

Why
Cyclone Swing Gates
don't drag or bind



This Cyclone-designed gate with ball and socket hinge is operated easily and is drag-proof

Few people ever seem curious about the hinges on a gate—until strain and constant use cause them to weaken and drag in the process of opening and closing. On drive and roadway gates, ordinary designs often fail after a few weeks or months of service.

To stop this dragging and teetering of drive gates and to insure ease of operation, Cyclone imbeds a sturdy ball and socket pivot hinge into the concrete at the base of the gatepost itself. Built of heavy malleable iron, its exceptionally large bearing surface cannot slip, twist or turn. Because the pivot rests directly in its socket, it carries most of the weight of the gate, which therefore cannot drag. The many advantages of this type hinge are easily recognized by engineers. This is but *one* of the many construction features that make Cyclone fence and gates the outstanding fence investment. Whether your requirements are large or small, Cyclone can fill them quickly.

GET THIS FREE BOOK ON FENCE

Before you decide on any fence, study the new free Cyclone book on "Fence—How to Choose It—How to Use It." Full of interesting facts and illustrations. The exclusive Cyclone "Choose Your Own" charts will help you to select wisely and economically—enable you to determine fence values for yourself. Just mail the coupon.

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Cyclone is not a "type" of fence, but is fence made exclusively by Cyclone Fence Company and identified by this trade-mark.

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Please mail me, without obligation, a copy of your book "Fence—How to Choose It—How to Use It."
Name.....
Address.....
City.....State.....
... I am interested in fencing ☐ Residence ☐ Estate ☐ Industrial property ☐ School ☐ Playground ☐ .....property
Approximate footage to be fenced.....ft.

LETTERS TO THE EDITOR

Social Insurance Plans

To the Editor of ELECTRICAL WORLD:

I found the discussion by H. C. Hasbrouck in the February 2 issue of ELECTRICAL WORLD on "Reserves for Jobless and Aged" both interesting and instructive. However, I do not approve of one paragraph in his article. He states: "In calculating the cost of a pension plan it is frequently desirable to include a 'discount for turnover.' For example, if a relatively large number of employees leave before retirement age, thus forfeiting their right to any pensions, the amount set aside for this purpose may be applied to reducing contributions for those who remain in service."

This idea is one of the greatest weaknesses in present pension systems of private corporations. Certain railways with pension systems use that plan. Now and then a man is removed from the payroll when he needs only two or three years more of service to be eligible for a pension. The excuse is used that the employee is no longer efficient or that his poor health does not warrant keeping him on the job. Quite frequently his ill health is a direct result of his years of faithful service in unhealthful surroundings. How can there be any old age security in a plan which will allow the snatching of a pension away from a man when it is practically within his reach?

To my way of thinking a pension should represent earned savings of an employee over a period of years. I feel that the ideal plan is for each employee to contribute a certain percentage of his salary or wages toward an old age pension and that the corporation he works for should match his contribution dollar for dollar. Whether the corporation contributes all of the money for the pension fund or whether it shares the cost with the employee does not change the fundamental principle of the plan. In either event the adoption of a pension plan really means an increase in wages for the employee. The increased wage will of course be paid by the consumer in the long run.

If an employee leaves his position before he has served the required number of years to be eligible for his pension, he should not be deprived of his proper share of the pension fund. An exception might be made of employees who leave after working only two or three years. Under a plan requiring, say, 30 or more years of service before the employee is eligible for pension benefits, said employee should

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GROUND TESTER

The "Megger" Ground Tester

"Gives us maximum protection from our lightning arresters"

"We feel that ground testing is absolutely necessary to give us the maximum protection from our lightning arresters and that the ('Megger') Ground Tester enables us to keep these grounds at a point of most service to us."

A Lighting Company in New York State.

"We have found that the 'Meg' Ground Tester far surpasses our expectations. In fact, we can hardly believe how such accurate results are obtained. . . ."

A Power Company in Pennsylvania.

Now is the time of year to take action on ground testing. "Megger" and "Meg" Ground Testers are The instruments for the purpose.

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not be deprived of his just share of the pension fund if he quits his position after 25 years of service. He should be permitted to withdraw 25/30 of the amount he would get had he worked the full 30 years, minus a sacrifice of 5 or 10 per cent. The amount could be paid in one lump sum or in monthly payments, according to agreement.

Further, a pension plan should be flexible to be of greatest benefit. After 30 years of service an employee would be entitled to a definite sum of pension money. Upon retiring at age 65, if the employee wants his pension distributed in monthly payments over a period of ten years he would have larger monthly payments than if distributed over a period of twenty years. In either event, if he should die before the payments are completed the balance of his fund should be paid to his beneficiaries just as though he had an insurance policy.

We would most certainly consider it dishonest as well as unfair for an insurance company, after the death of a retired policy holder, who is drawing his matured policy in monthly payments, to use the remaining sum of money due him and his beneficiaries for reducing the premiums of the remaining policy holders. An earned pension is, after all, very similar to a long-term endowment insurance policy.

These are merely my personal views and I speak for no one but myself.

J. I. HOLBECK,
Duluth, Minn.

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Advocates Welding Be Done by Welders

To the Editor of ELECTRICAL WORLD:

Referring to page 80 in the January 5, 1935, issue of ELECTRICAL WORLD, I wish to take exception to this remark by the contributor: "This overlaying is easy to do. It can be done by ordinary labor and does not require an experienced welder."

Two things are very obvious. The job was both planned (welding procedure control) and executed by a first-class experienced welder, and the contributor himself was not a welder.

Therein lies the danger to other readers. The suggestion and instructions are excellent. But do not attempt to use ordinary labor, get a first-class welder even if only for a few hours or days, and pay him a welder's wages.

Ordinary labor on a job like that may do more damage than can be rectified for many times the wage difference.

The electric arc, acetylene flame and cutting torch may be just tools of industry, like the hammer, saw and lathe, but remember this, it takes craftsmen to get the best results from them.

CHARLES L. WALL,
Berkeley, Calif.

New!

A Semi-Automatic MECHANICAL LINE SPLICE

● **NO HIDDEN PARTS**

Here is a simple compact line splice with only 7 parts, all of which are readily accessible. There is no guesswork in making a safe, dependable splice.

Insert the wire thru the hole in the locking nut and tighten nut down moderately. That's all! Furthermore, you have a joint that—

● **CAN BE SALVAGED *and* INSPECTED *after using***

This is another big advantage! Never before has there been a line connector of which all parts can be reclaimed. Every part is screw machine made which means uniformity. If by chance any parts should be lost or accidentally damaged, new ones can be substituted quickly.

***The* PERFECT SPLICE**

Features

- All parts screw machine made, guaranteeing accuracy and perfect operation.
- Non-corrosive thru-out. Pure copper and Everdur only.
- Gives perfect, safe joint on either stranded or solid wire.
- Proper clearance of tightening nut and full length grip of lug prevent injury to wire from line vibration.
- COLCO splice requires no extra tools to install or remove.

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76th and Vincennes Ave.
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CONNECT-O-LINE, Inc., 76th and Vincennes Ave., Chicago
☐ Send further information on COLCO connector
☐ Send sample for examination.
.....
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A Real Improvement in Overhead Line Joints

MEN OF THE INDUSTRY

Walter F. Wells Retires from Brooklyn Edison

Walter F. Wells, first vice-president and general manager and a director of the Brooklyn Edison Company, retired March 1 after more than 42 years of service. Just a few days prior to his retirement he had been re-elected to these offices for the year 1935. No announcement relative to Mr. Wells' successor has been made.

Mr. Wells has been a prominent figure

W. F. Wells

in the electrical industry for many years. He was president of the Association of Edison Illuminating Companies in 1915 and 1916 and president of the National Electric Light Association in 1918.

A graduate of Rutgers College, he was employed by the Edison Electric Illuminating Company of Brooklyn, predecessor of the Brooklyn Edison Company, from 1892 to 1897. He then became assistant general manager of the Manhattan Electric Light Company, a subsidiary of the Edison Electric Illuminating Company of New York, and was connected in a supervisory capacity with several companies which were merged to form the New York Edison Company. He co-operated in the preparation of the plans and superintended the installation of the electrical plant at the Waterside generating station. Upon completion of this station in October, 1901, he was placed in charge of its operation.

In 1905 he returned to the Edison Electric Illuminating Company of Brooklyn as general superintendent and in 1913 he was elected vice-president and general manager and a director of this company and the Kings County Electric Light & Power Company. The Edison Electric Illuminating Company was merged into the Kings County Company in 1919 and the latter became the Brooklyn Edison Company.

Throughout his career Mr. Wells has taken an active part in the technical and general activities of the electric light and power industry, heading or serving on numerous committees of the Association of Edison Illuminating Companies, the National Electric Light Association, the American Institute of Electrical Engineers and the New York Electrical Society. He was treasurer and director of the Electrical Testing Laboratories. He was a member of the American Committee at the World Power Conference in London in 1924 and has been a member of the Illuminating Engineering Society and the American Society for Testing Materials.

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N.E.M.A. Announces New Appointments

Announcement has been made by W. J. Donald, managing director of the National Electrical Manufacturers Association, of the appointment of Harry B. Kirkland as assistant to the managing director. Mr. Kirkland is well known in electrical circles. His work on behalf of the electrical manufacturing industry for many years as director of N.E.M.A.'s uniform legislation department has merited the highest commendation. Mr. Kirkland has recovered from a recent serious illness and is now back at the N.E.M.A. headquarters actively engaged in his new responsibilities.

R. Bourke Corcoran has been appointed director of the uniform legislation department. In addition his work will include the direction of the staff work on the N.E.M.A.-F.H.A. activity and the development of the trade extension activity report in accordance with the recommendation of the last meeting of the board of governors. Wentworth F. Gantt has been appointed director of the general service department to succeed Mr. Corcoran.

O. C. Small will be associated with Mr. Corcoran on the F.H.A. advisory committee work and on the trade extension report work. He will also continue some of his other duties which he has been handling for certain sections while in the general service department.

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▶ Ernest L. Godshalk, vice-president and general manager of the South Carolina Power Company, has been elected a member of the board of directors of the Commonwealth & Southern Corporation, succeeding George H. Howard, resigned.

G. H. Bucher Assumes New Executive Duties

George H. Bucher, president and general manager of the Westinghouse Electric International Company, has been elected a vice-president of the Westinghouse Electric & Manufaeturing Company with headquarters in New York. Mr. Bucher has been connected with the Westinghouse organization since 1909.

After graduating from Pratt Institute, Brooklyn, in both steam and machine de-

G. H. Bucher

sign and also electrical engineering, Mr. Bucher joined the Westinghouse Electric & Manufacturing Company at East Pittsburgh as a graduate student. In 1911 he was transferred to the export department at New York and in 1920 he was appointed assistant to the general manager of the Westinghouse Electric Internatianal Company. In 1921 he was advanced to the position of assistant general manager, in 1932 to the position of vice-president and general manager and in 1934 he was elected president and general manager. Mr. Bucher is a member of the American Institute of Electrical Engineers.

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▶ Samuel Ferguson, chairman of the Hartford Electric Light Company, has been elected a member of the board of directors of the Arrow-Hart & Hegeman Electric Company.

▶ Robert C. Anderson, residential and commercial sales manager of the Mississippi Power & Light Company, has been appointed to a similar position with the Memphis Power & Light Company. L. M. Taylor has been appointed to succeed Mr. Anderson as residential sales manager in Jackson and P. O. Smith has been appointed as supervisor of residential sales activities in the southern, south-

western, Natchez, western and central divisions with headquarters in Jackson. JOHN KIMBALL has been named supervisor of residential sales activities for the Jackson division. W. A. MOORE has been given the title of commercial manager and will have charge of commercial lighting activities for the entire state.

▶ A. S. PRALL, formerly a member of the House of Representatives from New York, was promoted last week to the chairmanship of the Federal Communications Commission by President Roosevelt after Eugene O. Sykes had asked to be relieved of the duties of chairman. Mr. Prall will serve for one year from March 11.

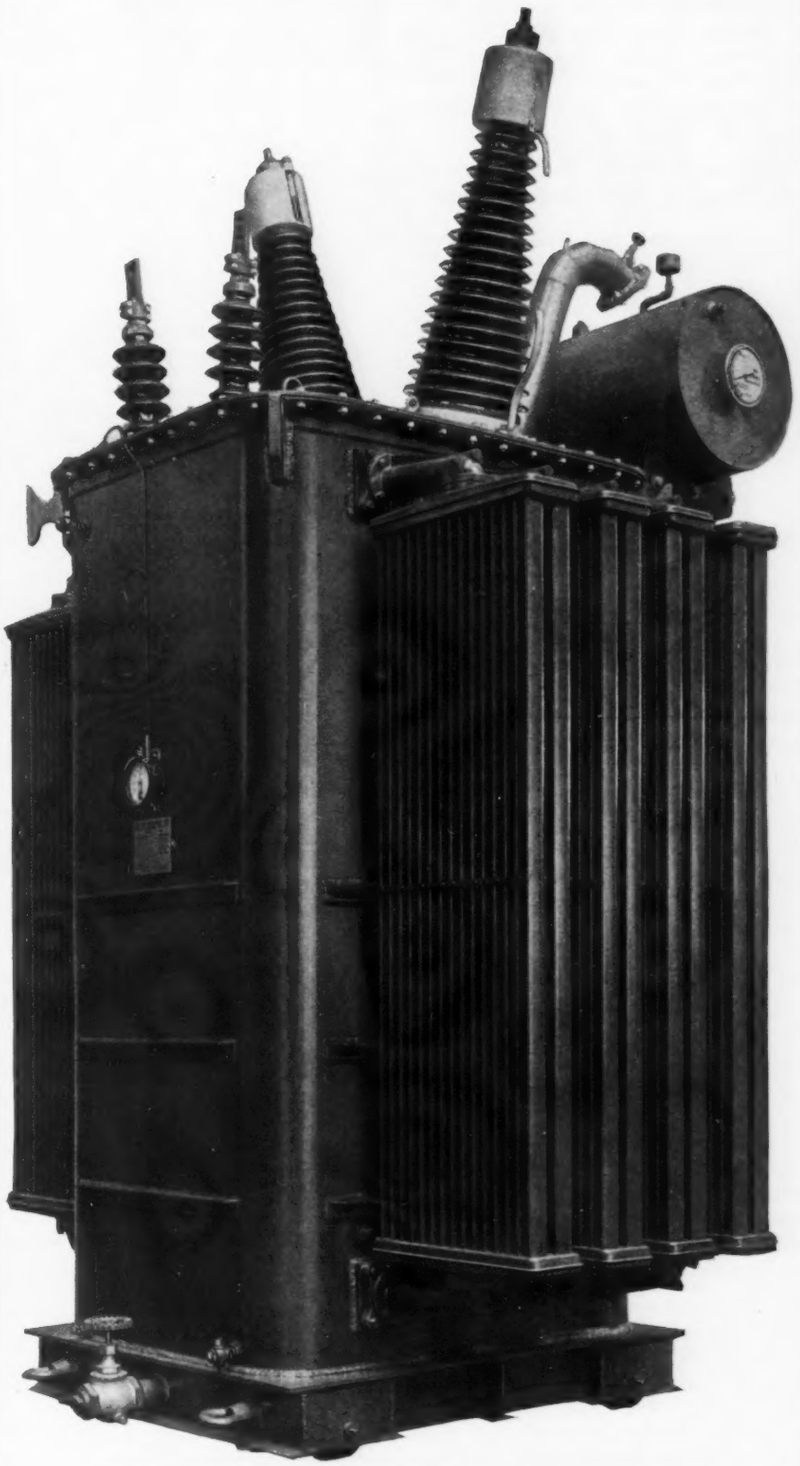
▶ MATTHEW HUTCHISON, for 40 years head of the municipal lighting department at Victoria, British Columbia, has filed his application for retirement. Born in Paisley, Scotland, Mr. Hutchison joined the city service in 1868 and was appointed superintendent of the electric light plant and fire alarm system. In 1912 he was appointed city electrical engineer and superintendent of the lighting department.

▶ FRANK C. MCCOLLOCH, attorney of Baker, Ore., has been appointed State Public Utilities Commissioner of Oregon's one-man utilities commission by Governor Charles H. Martin. He succeeds Charles M. Thomas, an attorney of Medford, who was appointed by Governor Meier four years ago.

▶ A. R. SMALL, president of Underwriters' Laboratories, Chicago, has been elected a member of the board of directors of the American Standards Association. He represents the fire protection group and the election is for the three-year term beginning Jan. 1, 1935.

▶ C. H. FLETCHER, chief electrical inspector of the city of Vancouver, B. C., for the past 30 years, has retired from active service. When Mr. Fletcher came to Canada in 1893 from England, his native country, he was employed in doing some of the first electrical installations in British Columbia. Mr. Fletcher has served as secretary of the Provincial Committee of the Canadian Electrical Code and as president of the northwestern section of the International Association of Electrical Inspectors.

▶ WILLIAM A. HUCKINS, division manager of the Utah Power & Light Company's Provo division for the past five years, has been appointed sales manager of the company, with headquarters in Salt Lake City, to succeed the late R. M. Bleak. Mr. Huckins has been associated with the Utah utility since 1913, when he started in the general sales department. Subsequently he engaged in sales work in the Ogden divison and in 1930 was promoted to the position of manager of the Provo division. Before joining the staff of the Utah Power



WAGNER POWER TRANSFORMER Single-phase 4000 kva., 60 cycle, 69000 to 2400 volt transformer. This transformer was installed in a location where dust is very prevalent and may accumulate on the bushings in sufficient quantities to cause normal rating bushings to flashover —therefore this transformer was furnished with 115 kv. high voltage bushings equipped with 69 kv. coordinating gaps for use on 69 kv. service (the H. V. bushings are of the oil-filled type). This is just one of the many details considered by Wagner engineers in supplying you with transformers that give uninterrupted and trouble-free service. Completely described in Wagner Power Transformer Bulletin 175, sent on request.

T135-1

Wagner Electric Corporation

6400 Plymouth Avenue, Saint Louis, U.S.A.

MOTORS TRANSFORMERS FANS BRAKES

& Light Company he was affiliated with the Des Moines Electric Company and with the Oregon Power Company. W. E. FLEETWOOD, district superintendent at Price, Utah, for several years, will take Mr. Huckins' place as Provo division manager.

▶ M. J. FOLEY has been elected chairman of the Wyoming Public Service Commission.

▶ VICTOR E. HULETT, who resigned as manager of the eastern division of the Wisconsin Power & Light Company, has been appointed commercial manager and assistant to the president of the Oklahoma Power & Water Company, Tulsa.

▶ J. T. LUSIGNAN, JR., formerly chief electrical engineer Ohio Insulator Company, Barberton, Ohio, is now engineering assistant to vice-president of the parent company, the Ohio Brass Company, Mansfield.

▶ CHARLES H. CALLIES, formerly vice-president of the Conlon Corporation, Chicago, manufacturer of household washing and ironing machines, has returned to the company as general sales manager. In the interval Mr. Callies has been actively engaged in the advertising agency field.

▶ I. N. MERRITT, formerly vice-president and general manager of the Grinnell Electrical Manufacturing Company, Grinnell, Iowa, has been named vice-president in charge of sales of the Meadows Manufacturing Company, maker of household washers and ironers and a subsidiary of the Electric Household Utilities Corporation. Mr. Merritt's headquarters will be in Chicago.

▶ LEON H. CURTICE has opened offices in New York City as manager for trade associations, consultant on group activities and trade relations and code authority executive. Mr. Curtice was formerly with the National Electrical Manufacturers Association, where his work in organizing the National Electric Cookery Council and in connection with the problems created by the Tennessee Valley Authority situation were outstanding.

▶ RAY P. TARBELL was recently appointed manager of the welding division of the Ideal Electric & Manufacturing Company, Mansfield, Ohio. Mr. Tarbell has been in the welding industry for the past seventeen years. During this period he spent thirteen years with the Lincoln Electric Company as sales engineer and district manager, two years with Robert E. Kinkead, Inc., consulting welding engineers, and two years as manager of welding electrode division of Babcock & Wilcox Company.

▶ O. M. HULLINGER has been appointed by the Line Material Company, South Milwaukee, Wis., to take charge of its transformer sales. Mr. Hullinger was formerly sales manager of the Tips Tool Company. Following graduation from the Armour Institute of Technology, he spent three years with the Lackawanna Railroad and ten years on the sales staff of the Ohio Brass Company.

▶ ERNEST O. THOMPSON has been elected chairman of the Texas Public Service Commission for the ensuing two years.

▶ F. S. PICKERT has been elected chairman of the South Dakota Public Service Commission for the ensuing two years.

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B. D. Christian Promoted

B. D. Christian, general sales manager of the Crocker-Wheeler Electric Manufacturing Company, with headquarters at Ampere, N. J., has been elected a vice-president of the company. Mr. Christian has been identified with the Crocker-Wheeler organization since 1914, when he became sales engineer in the Chicago office. Subsequently he served as manager of the Cleveland district, a position he retained until 1926 when he was appointed sales manager of the company.

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▶ A. H. JAEGER, formerly assistant to Pierre L. Miles, general sales manager of the Edison General Electric Appliance Company, has been appointed manager of the company's water heater sales division. Mr. Jaeger has been succeeded by D. C. MARBLE, manager of the central northwest district.

▶ THOMAS H. DOOLING has been appointed manager of the San Francisco branch of the Electric Storage Battery Company.

▶ G. A. FREEMAN, formerly supervisor in charge of air conditioning promotion of the Commonwealth Edison Company, has been appointed assistant manager of industrial relations, to succeed Byron F. Field, resigned.

▶ CHARLES M. TUTTLE has been appointed manager of the New England electrical wholesaling house of Milhender, Inc., Boston, Mass., following fifteen years' service with the General Electric Supply Corporation and its predecessor organizations.

▶ E. C. CURTIS, formerly switchgear specialist with the General Electric Company, at Portland, Ore., is now an electrical engineer with Ford, Bacon & Davis, Seattle, Wash.

▶ GEORGE A. ELZ, chief electrical operator at the Edgar generating station of the Edison Electric Illuminating Company of Boston, and WILLIAM NOYES, operating engineer of the Public Service Company of New Hampshire, Manchester, have been elected respectively chairman and secretary of the New England System Operators' Club for 1935-36.

OBITUARY

Dr. Michael I. Pupin

Dr. Michael I. Pupin, internationally famous as an inventor and scientist and professor emeritus of electromechanics at Columbia University, died March 12 at the Columbia-Presbyterian Medical Center, New York, in his seventy-seventh year. He had been ill for several years. Dr. Pupin was widely known among engineers and scientists for his researches and inventions in connection with long-distance telephone lines and for his advanced work in the passage of electricity

M. I. Pupin

through gases, electrical resonance and many other scientific subjects.

Born of Serbian parents in Hungary, he emigrated to the United States as a boy in 1874 and obtained manual employment. On the savings of five years he entered Columbia College, where he was graduated in 1883 with high honors. He took post-graduate work at the University of Cambridge, England, and the University of Berlin, Germany. In 1889 he returned to Columbia University and with the late Prof. F. B. Crocker started the electrical engineering department. Subsequently he took the chair of electromechanics.

In recognition of his achievements in research Dr. Pupin received many honors. These included the Hébert prize in physics from the French Academy, the Carson gold medal from the Franklin Institute, the Edison Medal, awarded to him by the American Institute of Electrical Engineers, and the John Fritz gold medal, the highest of American engineering honors. He was a past-president of the American Institute of Electrical Engineers, the American Association for the Advancement of Science and the Radio Engineers of America, and a member of many scientific societies.

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▶ E. B. ATCHLEY, director of public relations of the Ohio Edison Company at Akron, Ohio, and before that with the Northern Ohio Traction & Light Com-

pany, died at Akron February 25. Mr. Atchley went to the companies at Akron in March, 1920, from Kansas City, where he had been handling publicity for four years for the Kansas City Railways under President Philip J. Kealy.

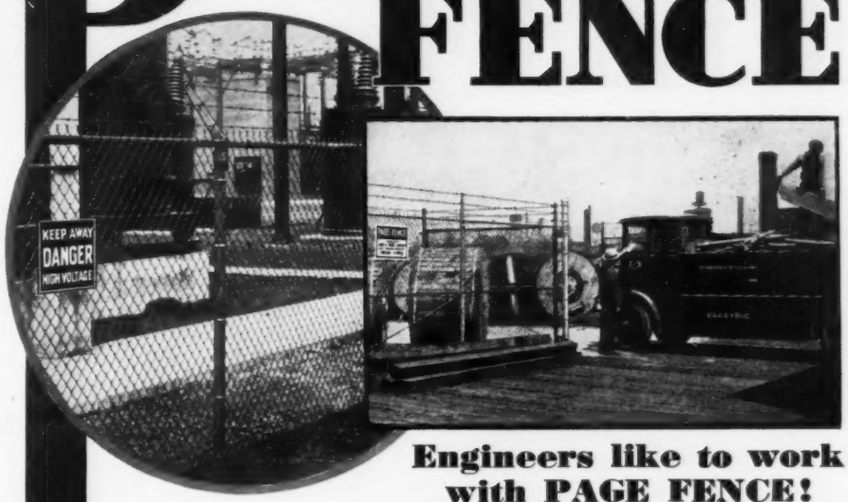
▶ JOHN J. TREACY, a member of the New Jersey Public Utilities Commission from 1914 to 1922, died February 26 at his home in Jersey City. A lawyer by profession, Mr. Treacy was an authority on utility, municipal and corporation law.

▶ LAWRENCE K. LANGDON, general counsel for the Union Gas & Electric Company, Cincinnati, Ohio, until his retirement in 1933, died February 27, following an illness of two months. He was 59 years of age. Mr. Langdon was one of the country's outstanding authorities on public utility law. While serving in the state Legislature, he was one of the leaders in drafting laws creating and governing the Public Utilities Commission. He became a member of that body and later one of its attorneys. He joined the staff of Union Gas & Electric as attorney, subsequently becoming general counsel. He was also a director of the company.

▶ RALPH M. BLEAK, superintendent of lighting and appliance sales of the Utah Power & Light Company, died in Salt Lake City February 5, of pneumonia. He was 44 years of age. Mr. Bleak had been identified with the Utah utility since 1915. He took an active part in the company's commercial activities and was also prominently identified with the work of the Northwest Electric Light and Power Association and other regional and national affairs of the electrical industry. At the time of his death he was chairman of the business development committee of the Northwest Association, a director of the Electrical League of Utah, and a former president of that organization.

▶ CLEMENT C. SMITH, utility executive and industrialist of Milwaukee, died February 14 in Pasadena, Calif. He was 68 years of age. After connections with the Great Northern Railroad and the Minneapolis Street Railway he went to Milwaukee in charge of the construction of the Milwaukee Street Railway. Except for a term of service as chief engineer of the Chicago City Railway in 1895 and 1896 his interests thereafter centered in Milwaukee in construction projects, utility enterprises, in industry and in banking, notably with the Columbia Construction Company, the Falk Company and the Fidelity Trust Company. He was largely responsible for the consolidation of the Wisconsin Electric & Interurban Railway Association and the Northern Electrical Association as the Wisconsin Electrical Association and was the association's first president.

PAGE FENCE



Engineers like to work with PAGE FENCE!

Ease of erection and low maintenance cost have long been strong points in favor of the specification of PAGE FENCE.

PAGE FENCE enjoys the reputation of being the most progressive in the fence business. PAGE pioneered by offering fence fabric of rust-resisting ARMCO Iron. PAGE pioneered with fabric of ALUMINUM. *Sure protection and investment against corrosion!*

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PAGE FENCE ASSOCIATION, Bridgeport, Conn.

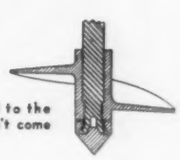
NEW YORK CHICAGO PITTSBURGH SAN FRANCISCO ATLANTA

AMERICA'S FIRST WIRE FENCE—SINCE 1883

The Anchor you Knew would some day be made New HI-TEST "MAL" SCREW ANCHOR

- Made of a New Metal
- Rust Resisting
- Lighter Weight
- Greater Strength
- More Pulling Power
- Thin Sharp Blades
- Easier Installation

The development of a New Hi-Test "Mal" Iron enabled us to produce the most efficient screw anchor ever made.
The excessive strength of the high test malleable iron used in the New Screw Anchor makes possible its thin blades and small helix—the ideal construction.
The galvanized steel rod with the drop forged thimble-eye is locked to the anchor at the factory. It cannot come loose or turn in the anchor—anchor can be screwed out intact.
We are proud in being able to offer you an *"Anchor that can really take it"*



Rod is locked to the anchor and can't come loose.

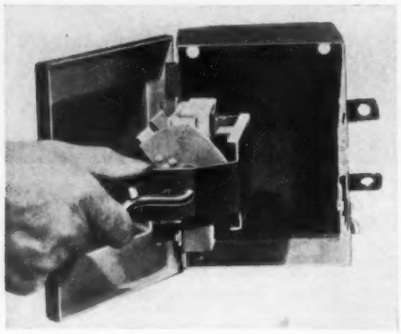
A·B·CHANCE CO. Utilities Division

FACTORY & GENERAL OFFICES, CENTRALIA, MO.

NEW EQUIPMENT

Swing-Out Interior Switch

A new line of 30-amp. switches with a swing-out interior has been announced by the Switch and Panel Division, Square D Company, Detroit. The entire interior of the switch swings out and



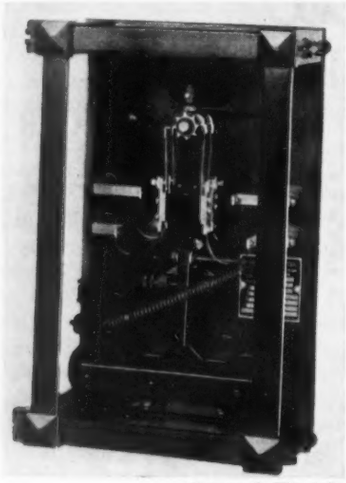
Square D

away from the box, leaving the box area open for wiring and conduit connections. This feature is said to cut greatly the time and cost of wiring. The new line is available in fusible and non-fusible, straight two-pole, two- or three-wire solid neutral switches, 125-250 volts, in 30-amp. sizes.

•

Field Voltage Regulators

A new line of a.c. and d.c. generator-exciter field-voltage regulators has been made available by the General Electric Company. Types GDA and GFA-4 are



General Electric

for a.c. machines and types GDD and GFD-2 (illustrated) for application to d.c. machines. The types GDA and GDD are direct acting; that is, the rheostat element is an integral part of the regulator unit, actuated by a voltage-sensitive regulating device. In all four types there are no vibrating contacts, the voltage-sensitive element being a form of torque motor balanced against a spring and controlled by generator voltage.

The advantages claimed are ease of installation, maintenance and operation, few moving parts, parts remain at rest unless voltage change is needed.

•

Electrode for Hardfacing and Cutting Edges on Tools

A new arc-welding electrode which is designed for restoring worn cutting edges on tools of all kinds and which is said to permit savings of 20 to 25 per cent in tool cost is announced by the Lincoln Electric Company, Cleveland, Ohio. This new electrode, known as "Toolweld," is the product of several years of research and of particular value to all industries using tools. Tools can be refaced an unlimited number of times with this electrode.

•

Glass-Housed Arrester

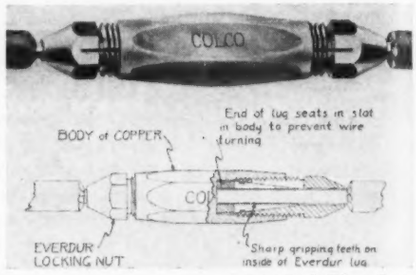
Designated as Type C, Catalog No. B-305006-16, a new glass-housed lightning arrester has been announced by the Line Material Company. It is for distribution circuits ranging from 5,000 to 9,000 volts grounded neutral, or 3,000 to 6,000 volts non-grounded neutral, and is accordingly suitable for 6,600 volts grounded Y and 4,800 volts delta system. The transparent housing of "Pyrex" heat-resisting glass allows a thorough inspection to be made of the inner parts of the arrester without its being disconnected from the line.

•

BONE CONDUCTION TYPE RECEIVER has been added to the hearing aid equipment produced by the Western Electric Company, New York, and designed by Bell Telephone Laboratories. The entire receiver weighs slightly more than ½ oz. Worn just back of the ear against the mastoid process, it has been designed to give a large area of contact with the head at that point. The bone conduction receiver transmits virtually the entire audible range of sound. It fits onto a tiny plug at the end of the transmission cord and can be used interchangeable with the air conduction type of receiver.

Mechanical Line Splice

A new semi-automatic mechanical line splice has been introduced by Connect-O-Line, Inc., Chicago. The manufacturer claims that it takes a strong, positive grip on the wire with no possibility of either


COLCO
End of lug seats in slot in body to prevent wire turning
BODY of COPPER
EVERDUR LOCKING NUT
Sharp gripping teeth on inside of Everdur lug

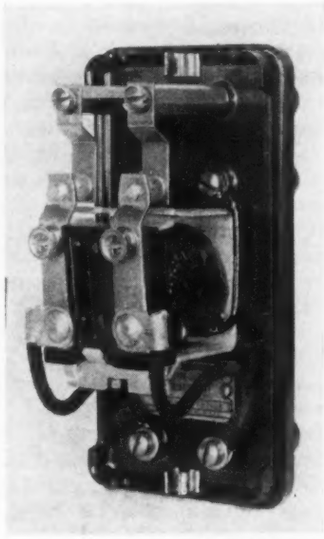
—Connect-O-Line Inc.

solid or stranded wire slipping or turning to cause line failure. The hexagonal body of the connector is of pure copper. Gripping lugs and tightening nuts are made of "Everdur." No extra tools are needed for installation or reclaiming. The accompanying illustration shows the simple trouble-free design.

•

Auxiliary Relay Has Two Contact Circuits

A small, sturdy, low-priced auxiliary relay for use on a. c. or d. c. and suitable for switchboard or panel mounting is an-



Westinghouse

nounced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh. This type SK auxiliary relay has two independent contact circuits which may

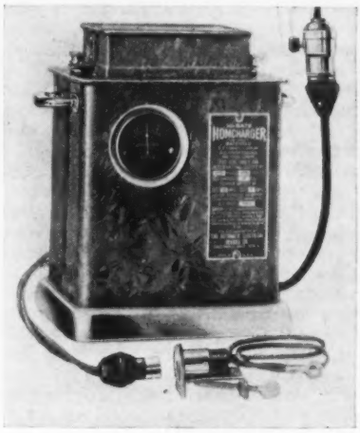
easily be adjusted for circuit-closing or circuit-opening service. For two independent opening circuits additional material must be added to the standard relay.

This relay is obtainable for circuits up to 550 volts a. c. or 440 volts d. c. It can be supplied with a coil for any current up to 5 amp. Each contact will carry a current of 12 amp. continuously and a current of 20 amp. for one minute.

•

Hi-Rate Homecharger

"Hi-Rate Homecharger," which starts charging at approximately 10 amp., this rate automatically dropping as the battery becomes charged, has been announced by the Automatic Electrical Devices Company, Cincinnati, Ohio. It



Automatic Electrical Devices

employs a clamp-on receptacle which requires no tools and needs but a single connection to the ammeter terminal in rear of the dash.

•

Marine Signal Lamp

Dependability and effectiveness of minor marine signal lights in harbors and internal waterways have been achieved with a lamp that produces a more uniform beam flash, according to an announcement by the Westinghouse Lamp Company, Bloomfield, N. J.

Improvements in this lamp claimed by the manufacturer are a prefocusing collar, positive focusing position of lamp, filament support cannot silhouette and cast shadow on lens. Lamp is available in seven amperages from 0.46 to 4.2.

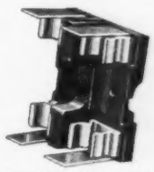
•

Motorized Speed Reducers

Compactness and economy are features of a new line of motorized helical gear reducers announced by Link Belt Company, Chicago.

The complete motor, with adapter and motor pinion, may be removed as a unit for inspection or maintenance without disturbing the alignment of the motor or of the gears remaining in the reducer housing. Motor pinion and gear are re-

Here is a new line of Colt-Noark switches that is up to the minute in every particular. Simple in design — positive in operation — rugged in construction. The 60 ampere fuses come out with a jerk — effectively and absolutely breaking all contact. The solderless connectors make their installation simple — and of course as in all Noark switches there is an abundance of wiring space on top and bottom. Two types, one for meter use only and the other for combination meter and range service. Boxes for surface or flush mounting — with an auxiliary door for removing fuse holders and plug fuses.



Fuse Holder Removed

The "Rampant Colt"
You will enjoy the "Rampant Colt", the news organ of Colt's Electrical Division. It's free — send in your name.

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ELECTRICAL DIVISION
COLT'S PATENT FIRE ARMS MFG. CO., HARTFORD, CONN.

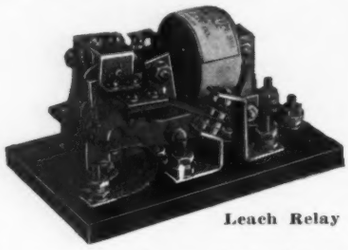
COLT-NOARK
SWITCHES - MOTOR STARTERS - FUSES

movable without disconnecting the driven machine or disturbing the low-speed gears. The reducers are available in double reduction from ½ to 75 hp., in ratios up to 38½ to 1, and in triple reduction up to 30 hp., in ratios up to 292 to 1.

•

Impulse Relay

An alternate contact impulse relay has been announced by the Leach Relay Company, Los Angeles, Calif. The contacts of the relay alternate their position with consecutive impulses of the input circuit. Time required for the shifting from one position to the other is 1/60 second, according to the manufacturer. When using the pallet switch as a coil cut-off no current is broken and no arcing occurs at the contacts that were closed to shift the relay over. This circuit is broken by the pallet switch. The impulse relay can be adapted to use with pressure regulators, thermostats, timers, low-voltage remote, telltale systems, photo-cell systems, etc., and makes possible new lock-out schemes, alarm systems and safety devices.



Leach Relay

•

Spiral-Record Recorder

An electrical operation recorder which draws a spiral record on a round chart has been announced by the Bristol Company of Waterbury, Conn. The spiral record is accomplished by a telechron cam which continuously resets the movement so that the instrument draws a spiral curve from the outer edge of the circular chart toward the center. A small electromagnet which is energized when the external circuit is closed records the occurrence of an operation. An open record with the advantages of easy filing are among the features claimed by the manufacturer.

•

Standard Drill

Skilsaw standard drill, which has as its first major point a specially designed motor which delivers substantially more power under load for a drill of this size, has been announced by Skilsaw, Inc., Chicago, Ill. The motor used is of the universal type, for operation on d.c. or a.c., 60 cycle or less (all voltages), and the armature is statically and dynamically balanced to eliminate vibration. Field and armature windings are baked in bakelite and varnish to insure perfect insulation and long life.

The Skilsaw is housed in a die-cast aluminum alloy body, a feature which means increased strength and lighter weight, greater accuracy, interchangeability of parts, a dense surface, and has many other advantages not found in ordinary sand castings. Some of the features are: Compactness and light weight (15 lb.), free speed (500 r.p.m.), extra capacity (100 per cent overload), etc.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

The American Brass Company, Waterbury, Conn., has published two new bulletins: Anaconda Publication B-14, covering applications and advantages of Anaconda free cutting brass rods and giving comparative costs of screw machine products of brass and steel; Publication B-21, stating applications, advantages, fabrication procedure, physical and mechanical properties of beryllium copper.

The Northern Equipment Company, Erie, Pa., has recently issued a pamphlet, "Operating Experience at Masonite," giving operating experience and diagrams of feedwater regulator installation, with sample steam flow charts.

Catalogue No. 2003, "Brown Flow Meters," published by the Brown Instrument Company, Philadelphia, covers in 55 pages the construction, design and operation features of both the electrical and the mechanical flow meters with example of their application.

A 70-page catalogue has been issued by Monitor Controller Company, Baltimore, Md., which gives complete ratings and specifications for its line of control equipment as well as some useful engineering tables on motor and wire ratings.

Federal Specification Board, Room 735, Federal Warehouse, Washington, D. C., has announced bulletin W.L.-111a, "Proposed Revision of Federal Specification for Lamps, Electric, Incandescent, Miniature, Tungsten-Filament," dealing with proposed specifications for lamps purchased by the federal government.

Bulletin No. 1134, which covers its complete line of anchors and other pole line specialties, has been issued by the Everstick Anchor Company, Fairfield, Iowa. Holding power in various soils is stated.

Binks Manufacturing Company, 3114 Carroll Avenue, Chicago, has announced a new 32-page booklet briefly covering its entire line of portable spray outfits, booths and exhaust units.

A series of pamphlets is now available from the General Electric Company covering construction, application, specifications and ratings of control and signal transformers; operating details and features and current oscillograms of type MC-5 air circuit breakers; construction details and applications of type TC vertical-break, outdoor, horn-gap switches, and a condensed catalogue of the line of full-bolted power connectors illustrating different applications.

SALES OPPORTUNITIES IN NEW CONSTRUCTION

LOUISVILLE, KY. — Louisville Gas & Electric Company is arranging appropriation of about $507,000 for extensions and improvements in plants and system in 1935, including rebuilding of 66,000-volt transmission line, new power substation and removal of present substation on Campbell Street to such location, extensions in electrical distribution lines and service facilities, and miscellaneous work.

GLOBE, ARIZ.—Plans new city-owned electric light and power plant, including electrical distribution system. Fund of $150,000 is being arranged. W. A. Sullivan, mayor, is active in project.

GARY, IND. — American Sheet & Tin Plate Company, Pittsburgh, Pa., a subsidiary of United States Steel Corporation, New York, N. Y., plans installation of motor-generator sets, heavy-duty motors and controls, electric furnace units and accessories, electric cranes and hoists, conveyors and other equipment for expansion and improvements in steel sheet mills and tin plate mills at Gary, reported to cost about $11,500,000 and $3,300,000, respectively.

BAYARD, NEB. — Chimney Rock Power Company, Bayard, L. A. Fricke, secretary, has authorized surveys for transmission and distribution lines, power substations and service facilities for proposed electrification project in rural districts of Scotts Bluff and Morrill Counties. Cost about $400,000. H. H. Henningson, Union State Bank Building, and H. C. James, 3828 North Nineteenth Street, both Omaha, Neb., are consulting engineers.

PHILADELPHIA, PA.—Bureau of Yards and Docks, Navy Department, Washington, D. C., asks bids until March 27 for one 10-ton electric bridge crane, and for four 2-ton electric-operated monorail hoists for Naval Aircraft Factory, Philadelphia Navy Yard (Specification 7892).

HOLYOKE, MASS. — Chemical Paper Manufacturing Company plans new hydroelectric power plant for mill service. Cost about $125,000, with equipment. R. L. Bosworth is manager of power and maintenance department.

SPARTA, MICH. — Consumers Power Company, Jackson, Mich., plans new power substation in vicinity of Sparta. Cost about $50,000.

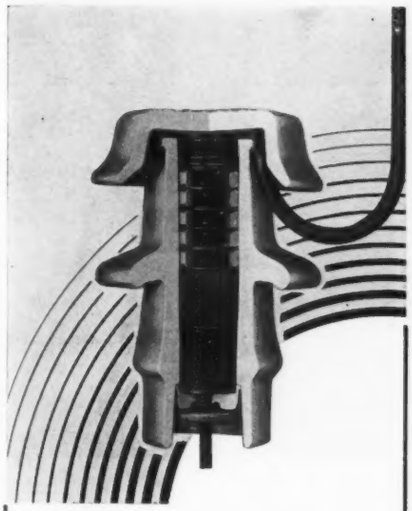
CEDAR RAPIDS, IOWA—Iowa Electric Light & Power Company, Cedar Rapids, plans extensions in transmission lines in parts of Story and Polk Counties. Application has been made for permission.

STERLING, ILL. — Northwestern Barb Wire Company plans installation of heavy-duty motors and controls, regulators, transformers and accessories, conveyors and other equipment for expansion and improvements in plant, including new rod mill. Cost close to $3,000,000.

LOUISVILLE, KY. — Old Kentucky Distillery, Inc., has approved plans for new multi-unit plant on 15-acre tract of land on Dixie Highway and proceeds with superstructures at once. Cost about $200,000.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, Washington, asks bids until March 28 for three single-phase transformers, oil circuit breaker, knife switches, frequency changer, electric portable drill and other equipment (Schedule 3039).

OKLAHOMA CITY, OKLA. — Oklahoma Gas & Electric Company is arranging appropriation of $755,700 for extensions and



50,000 AMPERES

discharge capacity

● To meet the requirements of present-day operation Westinghouse has redesigned its line of LV Arresters, to withstand surges up to 50,000 amperes—far in excess of any existing arrester of the same capacity.

Other improved features of the new LV arrester are:

1 Longer life because abnormal system voltage cannot cause unnecessary arrester mortality.

2 No radio interference because moisture cannot enter.

3 Drop-out feature prevents line grounding should the arrester be destroyed.

4 *Every* arrester is given a surge test to assure correct operation.

5 Blue-gray color to facilitate distinguishing from old arresters.

◆

Just address Westinghouse, Room 2-N, East Pittsburgh, Pa. for complete information.

R-54003

Westinghouse

New

LV ARRESTERS

improvements in power plans and system in 1935, including transmission and distribution lines, power substations, service facilities and miscellaneous work.

CHICAGO, ILL. — Olson Rug Company plans new power house at mill in connection with six-story factory addition. Cost over $150,000, including motors and controls, regulators, conveyors and other electrical equipment for mill service. Weiss & Niestadt, 343 South Dearborn Street, are architects.

PINE BLUFF, ARK.—Arkansas Power & Light Company has authorized new transmission and electrical distribution lines in Ozark district, totaling about 100 miles, as first section of proposed rural electrification project in different parts of State. Cost over $300,000, with power substations and service facilities. Entire project will comprise approximately 3,500 miles, estimated to cost about $5,000,000.

LAMONI, IOWA—Asks bids until March 26 for equipment for new city-owned electric light and power plant, including Diesel engine-generating units and accessories, transformers and auxiliary equipment, switchboard and electrical distribution lines. Fund of $100,000 is available. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

ALBANY, N. Y. — Public Utilities Commission, City Hall, recently organized by new municipal law, will make immediate surveys and estimates of cost for proposed city-owned electric light and power plant for public buildings, street-lighting and other service. New law authorizes bond issue up to $10,000,000 for project.

BURLINGTON, N. C. — Tower Hosiery Mills plan installation of motors and controls, conveyors, etc., in new addition to knitting mill. Cost about $125,000.

NILES, OHIO — Has engaged Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., consulting engineer, to prepare plans for new city-owned electric light and power plant. Will arrange financing $500,000 for project.

HEBRON, NEB. — Proposes construction of transmission line, about 100 miles long, to connect with system of Columbus Power & Irrigation District project, for local light and power service. Program includes local distribution lines, power substation, switching station and service facilities. Estimates of cost under way. Roy A. Young, city clerk, in charge.

PORT HURON, MICH. — Muller Brass Company plans installation of motors and controls, conveyors, etc., in proposed new additions to brass and bronze products plant. Cost over $150,000.

SENECAVILLE, OHIO — United States Engineer Office, Zanesville, Ohio, asks bids until April 2 for new dam near Senecaville, including lighting and power system, electrical conduit system, operating house, electric crane and hoist, and other electrical equipment (Circular 67).

TAMPA, FLA. — Lyons Fertilizer Company plans installation of motors and controls, electric hoists, conveyors, loaders and other equipment in connection with proposed rebuilding of commercial fertilizer plant, recently destroyed by fire. Loss close to $200,000.

DELTA, COLO. — Plans early special election to approve bonds for proposed city-owned electric light and power plant. Cost reported over $125,000, with distribution lines. Wood & Weber, Denver, Colo., are consulting engineers.

VILLA PARK, ILL. — Wander Company, 180 North Michigan Avenue, Chicago, plans installation of motors and controls, conveyors, hoists, etc., in new multi-story addition to malt products plant at Villa Park. Cost close to $200,000.

boost

RURAL VOLTAGE *economically*

On scores of rural lines the new Westinghouse BR Booster has proved that it is now economically possible to maintain a reasonably normal voltage . . . even during periods of peak demand.

This automatically controlled booster is easily and quickly installed . . . requires only a small initial investment . . . needs practically no maintenance or attention.

It hangs on a pole just like a distribution transformer . . . has no moving parts except a control relay and contactors. Its control cabinet is separated from the main tank and is readily accessible. It can be supplied either voltage or current-controlled.

◆

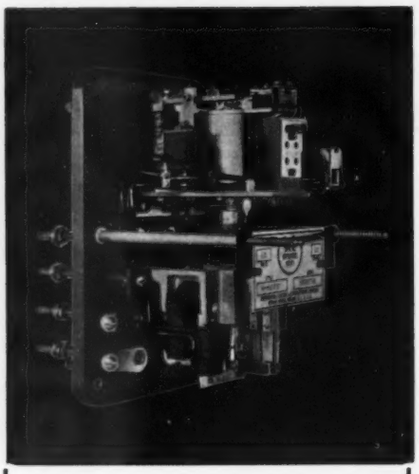
Write Westinghouse, Room 2-N, East Pittsburgh, Pa. for complete information.

R 59004

Westinghouse

The New

BR BOOSTER



GET
HIGH-SPEED
DISTANCE
PROTECTION

-- by adding the HZ-1 Relay to your present Protective Relays . . .

This new one-step relay gives all of the advantages of high speed protection at a very low cost when present relays will allow its addition.

Among its outstanding features are:

1—One-cycle protection for 80% of the line. The impedance and directional elements operate in one cycle or less, and clear the faults which generally do the most damage.

2—Selectivity by measuring the distance to the fault.

3—High-speed induction dynamometer directional element which operates over a wide range of voltage and current.

Complete information about the HZ-1 will be sent promptly upon request.

R-57010

Westinghouse

Room 2-N East Pittsburgh, Pa.

SINCE 1888
METERS INSTRUMENTS RELAYS

Recent Rate Changes

Massachusetts power companies' directors will be called upon to approve rate reductions totaling $2,025,100 this year as a result of a report of a special committee of utility men and others to Governor Curley, filed recently at the executive offices. The program calls for a reduction of about $775,000 for Boston Edison customers, nearly 400,000 in number, with a cut in the retail rate from 7 to 6.5 cents per kw.-hr. Household and retail commercial rates are involved. It is planned to bring about the reductions by simplification of schedules and by slashes in top rates where practicable, as well as by the elimination of room and area type rates in every case where it is feasible. The committee recommended the further consideration of the possibilities of developing a sliding scale rate plan for general use in Massachusetts, following Governor Curley's expressed desire that the merits and feasibility of the Washington plan be investigated. Ninety-eight per cent of the consumers of the state are served by the companies in agreement to lower rates, which will be effective April 1 if the expected favorable action of directorates occurs. Governor Curley has agreed to ask the Legislature for a $10,000 appropriation to meet the cost of a survey of the sliding scale, of consolidation possibilities and of financial aspects of utility development, with special reference to the regulation of security issues.

•

Duquesne Light Company has announced that reductions in electric light rates estimated at $1,281,000 a year will be made effective on bills mailed May 1. The greater portion of the reduction will be applied to the residential and commercial classifications.

•

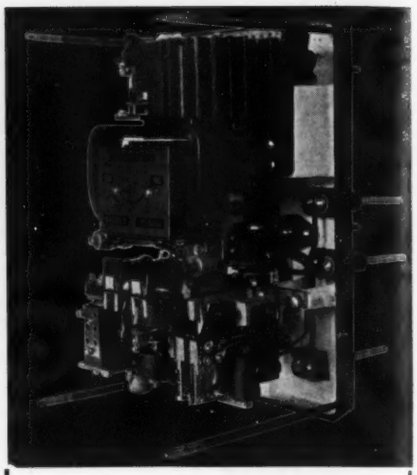
Public Service Company of New Hampshire has made a sweeping cut in rates embracing over 100 cities and towns, effective March 15, and paring $344,000 per year from the bills of 53,000 domestic and commercial customers. The new tariff does away with the general use of room and area rates, as well as the former 5 per cent charge for delayed payments. Domestic users will save about $225,000 and commercial users $90,000.

•

Florida Power & Light Company has announced another reduction in lighting rates, the second within the past nine months, for all territories covered by the company except the city of Miami. The new low rates are effective April 1. The saving to lighting customers will total approximately $150,000 annually.

•

Maryland Public Service Commission has handed down an order in which it allocated $265,000 of a rate reduction totaling $325,000 to the Maryland cus-



SPEED

The essence of modern system protection, is assured by the HCZ Relay, at comparatively low cost . . . . . .

◆ This new relay gives one-cycle protection for at least 80% of the line, and ½ to ¾-second protection for the rest of the line, depending upon the location of the fault. This performance is made possible by:

1—High-speed impedance element of the balance-point type which clears close-in faults within one cycle or less.

2—Second step impedance element that has a time characteristic varying directly with the distance to the fault.

3—High-speed directional element operating on low current and voltage.

4—Two targets show the relative position of the fault, thus enabling the operating company to reduce its maintenance expense.

The HCZ has many other advantages about which you should know. Ask for information.

R 57011

Westinghouse

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SINCE 1888
METERS INSTRUMENTS RELAYS

tomers of the Potomac Edison Company. In keeping with this decision the commission prepared schedules of rates to carry the reduction into effect.

•

Worcester Electric Light Company has announced a new promotional rate effective April 1, eliminating the present restrictions as to appliances and rooms and consolidating three domestic rates into one easily understood schedule. The estimated annual saving to customers is approximately $70,000.

•

Westchester Lighting Company and Yonkers Electric Light & Power Company have petitioned the New York Public Service Commission for permission to reduce electric rates $1,141,512 a year—general consumers $1,009,000 and municipalities $132,000. In their petition the companies have adopted what is known as the Commonwealth & Southern plan. In addition to giving an immediate cut in electric rates to both commercial and domestic customers, the new schedule provides an inducement feature giving still lower rates to those increasing their use of energy by a specific amount over the corresponding month of the previous year.

•

Central Illinois Public Service Company has been ordered by the Illinois Commerce Commission to reduce its electric rates in 52 cities, towns and villages, effective April 1. New schedules will save the company's customers $200,000.

•

San Antonio Public Service Company has offered to reduce its domestic electricity rates per kilowatt-hour from a maximum of 6½ cents to 5¾ cents and to adjust commercial rates so that consumers will save $326,000 annually. The San Antonio Central Power Company, asking a franchise, has promised electric service 25 per cent cheaper than existing rates, while the city threatened municipal service unless rate cuts are forthcoming (ELECTRICAL WORLD, March 2, page 87).

•

New York Public Service Commission has approved revisions of the electric rate schedules of the Utica Gas & Electric Company, Northern New York Utilities, Inc., and the New York Power & Light Corporation which will save domestic consumers approximately $185,000 annually.

•

United Illuminating Company, New Haven, Conn., has announced rate changes effective March 1, that will result in a total saving of $400,000 for customers annually.

•

Atlantic City Electric Company will put into effect April 1 next, instead of March 1, 1936, the maximum rate reductions proposed by the company under a progressive scale of reductions.

Electrical Insulations

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Plates, Segments, Rings, Tapes, Cloths, Tubes, Washers, Rope Paper and Mica, Fish Paper and Mica.

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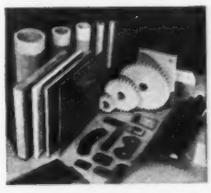

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General Electric Co., Schenectady, N. Y.
Kelvinator Corp., Detroit, Mich.
Westinghouse E. & M. Co., E. Pittsburgh, Pa.

AMMETER, CLIP-ON
Columbia Elec. Mfg. Co., Cleveland, Ohio
Ferranti, Inc., New York, N. Y.

ANALYSES, REVENUE
Recording & Statistical Corp., New York, N. Y.

ANCHORS, GUY
Chance Company, Centralia, Mo.
Everstick Anchor Co., Fairfield, Iowa.
Hubbard & Co., Pittsburgh, Pa.
Kearney Corp., James R., St. Louis, Mo.
Line Material Co., South Milwaukee, Wis.

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General Electric Co., Schenectady, N. Y.
Graybar Electric Co., New York N. Y.

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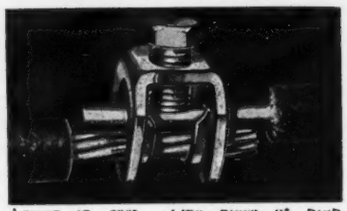

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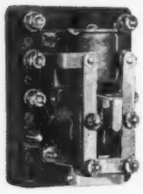

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